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II. Glossosomatidae and Philopotamidae (Annulipalpia)

F. Schmid

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11 GLOSSOSOMATIDAE AND PHILOPOTAMIDAE (ANNULIPALPIA)

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REVIEW OF CANADIAN TRICHOPTERA

II Glossosomatidae and Philopotamidae (Annulipalpia)

F Schmid

Introduction

This is the third in a series of papers on the trichopteran fauna of Canada. It deals with the Glossosomatidae and the Philopotamidae. These are families of medium size whose status is still primitive. The Glossosomatidae are derived from the Rhyacophilidae, but are distinctly more specialized. They show suprising morphological diversity. Consequently, the family had to be divided into several subfamilies, and Glossosoma had to be divided into several subgenera. Glossosomatidae is the most primitive of those families whose larvae make cases. The Glossosomatidae belong to the superfamily Rhyacophiloidea of the suborder Annulipalpia. They are not members of the Integripalpia line (Schmid 1980, fig 1).

The family Philopotamidae is the most primitive of the superfamily Hydropsychoidea. Although their body and wing characters are still very primitive, the simplification of the male genitalia is clear evidence of specialization. Philopotomidae is the most primitive of those families whose larvae build silken trap-retreats.

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Morphology

I have not included a generalized diagram showing the structure of the genitalia. The genital parts vary so much from one group to another that such a diagram would be useless. I refer instead to a list of the abbreviations used in the diagrams, to illustrate the characters mentioned in the keys whenever clarification is needed. These abbreviations are the following:

a ph --phallic apparatus
c --cerci of the female
éd --aedeagus
end --endotheca
inf --claspers
int --intermediate appendages
oc --ocelli
par --parameres
ph --phallotheca
1,2 --first and second articles of claspers
p l --labial palpi
p m --maxillary palpi
pr --preanal appendages
s ph --phallotremal sclerite
tend --tendons connecting the preanal appendages and claspers in the Glossosomatidae
vag --vaginal apparatus

VII st, VIII t, VIII st, IX, X, XI --refer to posterior abdominal segments and their tergites and sternites.

Family Glossosomatidae Wallengren

Glossosomatidae Wallengren, 1891, p 163. Type genus Glossosoma Curtis.

Glossosomatidae: Ross, 1956, p 127.

Ocelli present. Maxillary palpi in both sexes made up of five articles, the first two very short, the second particularly globular. End of terminal article of maxillary and labial palpi slightly pointed or blunt (fig 2). Spurs 0, 4, 4; 0, 3, 3; or 2, 4, 4. Abdominal blood gills absent. Development of internal gland of sternite V highly variable. Tegulae specialized, forming a curious helicoidal structure (fig 37).

The wings and venation differ so much among the three subfamilies that an overall description is impossible. The only two constant characters are of little importance and, furthermore, are inconspicuous in the Protoptilinae. The first character involves the R1-Rs and M-Cu1 bifurcations, which are ogival and symmetrical, and located very basally (fig 3, 12, 85). The second involves the veins Rs, R4+5 and R5, which are roughly aligned in the forewings.

Male and female genitalia: again, a description applying to the family as a whole is not possible. This is because these structures represent very different stages of specialization, at the subfamily, genus, and even subgenus levels. Nevertheless, it can be noted that the intermediate appendages of the male have disappeared, the claspers are uniarticulated, and the phallic apparatus is located rather high in the abdomen. The genitalia of the female are similar

to those found in the Rhyacophilidae: the cerci are slender and uni- or biarticulated, the anovaginal opening is found at the apex of segment X, and there is no vulval scale.

The family Glossosomatidae is hence very diverse, but nevertheless homogeneous, since it is easy to relate the different taxa to each other phylogenetically. Furthermore, the larval and pupal stages are much more uniform and clearly demonstrate the unity of the family. The Glossosomatidae are divided into three subfamilies: the Glossosomatinae, the Agapetinae, and the Protoptilinae. The first two show such fundamental differences in the hindwings and the male genitalia that one must conclude that they differentiated from each other very early on. Protoptilinae is the most specialialized of the three subfamilies and the most different from the other two; however, the structure of the genitalia shows that it differentiated from the subgenus Glossosoma s. str., hence after the genus Glossosoma s. l. itself divided into subgenera, ie relatively recently.

The Glossosomatidae all live in running water and the family has a ubiquitous distribution. The larvae build very characteristic cases, shaped like turtle shells, with the dorsal portion made up of larger pebbles than the plastron. At pupation, the plastron is removed, and the dome is fixed to the stony substrate. The larvae are often gregarious and live on the most exposed surfaces of the stones.

KEY TO SUBFAMILIES

1a Spurs 0, 4, 4 or 0, 3, 3. Both pairs of wings long and very

narrow, with reduced and inconspicuous venation (fig 104) ....
.....Protoptilinae p 20

1b Spurs 2, 4, 4. Both pairs of wings quite regularly elliptical, with complete or near-complete venation (fig 3, 85).....2

2a Hindwings with discoidal cell closed, R1 long and ending at the edge of the wing (fig 3, 12).....Glossosomatinae p 3

2b Hindwings with discoidal cell open, R1 short and extending to R2+3 (fig 85).....Agapetinae p 16

Subfamily Glossosomatinae Wallengren

Glossosomatidae Wallengren, 1891, p 163. Type genus: Glossosoma Curtis. This subfamily consists of only the type genus.

Genus Glossosoma Curtis

Glossosoma Curtis, 1834, p 216. Monobasic type species: Glossosoma boltoni Curtis.

Spurs 2, 4, 4. Midlegs of the female usually flattened and ciliated. Both pairs of wings regularly oval and of the same width. Venation complete (fig 3, 12), with all forks present: I, II, III,

IV, and V in the forewings and I, II, III, and V in the hindwings. Discoidal cell closed and median cell open in both pairs of wings. Hindwings with RI splitting into RIa and RIb. RI-Rs and M-CuI bifurcations symmetrical and located very basally, at the same level. Rs, R4+5 and R5 lie in approximately the same line. Discoidal cell small, subtriangular, and slightly oblique at the top, since it shares a much longer boundary with f2 than with f1. In the hindwings, RI present, long and parallel to Rs. Sternites VI and VII with plates and ventral lobes more developed in the male than in the female.

Male genitalia (fig 4, 13, 35, 40) highly differentiated in the different subgenera, which makes a generic description difficult. Segment X reduced to a membranous lobe, which is usually completely hidden by the large preanal appendages that are contiguous with it. Intermediate appendages absent. Claspers large and uniarticulate or absent. Phallic apparatus well developed, sometimes simplified by the loss of the parameres, and located in the middle of segment IX, above the claspers.

Female genitalia (fig 8, 25, 38, 69) very homogeneous, again very similar to those of Rhyacophila, also with an elongate ovipositor and two pairs of long apodemal projections. Segment VIII shaped like a regular tube, but sometimes elaborated by proximal and apical notches. Segment IX generally clearly visible and distinctly sclerotized. Segment X relatively very elongate and heavily chitinous dorsally and laterally. Segment XI ovoid and bearing two long, slender, uniarticulate cerci. Vaginal apparatus at the end of a long, membranous, vaginal vestibule as in Rhyacophila and evaginable from the abdomen during mating (fig 9-11, 61-68).

Genus Glossosoma is rather heterogeneous and has been divided into ten subgenera (Ross, 1956), of which only six are valid. Of these, three are found in Canada. Anagapetus should be added to the Canadian group. These subgenera are distinguished strictly on the basis of primary and secondary sexual characteristics, which make females unidentifiable unless they can be compared with females of the respective groups. Only members of Anagapetus can be identified otherwise, by their blackish colour, their unbroadened midlegs, and their simple segment VIII.

Glossosoma is a medium-sized genus with a Holarctic and Oriental distribution. There are a dozen Canadian species, which live only in cold running water, although they can be found occasionally in large lakes.

KEY TO SUBGENERA

1a Claspers of the male very large, sharply curved downward and deeply cleft distally (fig 4-7).....Anagapetus Ross p 4

1b Claspers not very large and not sharply curved or cleft.....
.....2

2a Apico-lateral margin of segment IX extending far posterad and forming a capsule which almost completely encloses the other genital parts (fig 40-49).....Ripaeglossa Ross p 10

2b Segment IX does not form such a capsule.....3

3a Aedeagus small, with vertical parameres, completely hidden within the genital cavity, with a tendon linking the phallotheca to the preanal appendages (fig 15-19)..... Synafophora Martynov p 6

3b Tendons linking the phallotheca to the preanal appendages produced as two large appendages around the aedeagus. Claspers missing (fig 35-36).....Anseriglossa Ross p 9

Subgenus Anagapetus Ross

Anagapetus Ross, 1938, p 109. Monobasic type species. Anagapetus debilis Ross.

Midlegs of the female not broadened. Anal cells of male forewings free of calluses. Male sternite VII with short, blunt ventral lobe.

Male genitalia (fig 4-7): segment IX annular and robust, and forming a slight, setiferous, lateral projection. Preanal appendages simple and triangular. Claspers very large and sharply curved downward with a deep apical notch separating two thin and very spiny branches. These appendages are linked to the preanal appendages by a bidentate basal superior lobe. Phallic apparatus short and stout, greatly reduced, and located very high above the claspers. It is made up of the phallotheca, the endotheca, and a terminal part, which is probably the modified aedeagus. This part resembles a horizontal U,

opening backward. Its superior branch is simple and slender, while its inferior branch is thick and also concave like a U. The phallic apparatus is similar in all the species.

Female genitalia (fig 8): segment VIII simple, with a slight dorso-apical notch and an indistinct anterior edge. Its apical edge is vertical, and straight or slightly wavy. Segment IX wholly membranous and virtual. Vaginal apparatus very slender and thin with a very distinct head (fig 9-11).

Anagapetus is a small western Nearctic and eastern Siberian genus, represented in Canada by only three species. The males can be distinguished easily by the shape of their preanal appendages and claspers. The females, however, differ only with respect to the vaginal apparatus. All three species live in the rapid and very cold waters of small clear streams, slightly downstream of the source.

KEY TO THE MALES

Genitalia with two deeply notched claspers.

1a Claspers with a very wide notch, more than half the length of the appendage, separating two very slender branches. Preanal appendages slightly longer than high (fig 6) .....
.....bernea Ross p 5

1b Claspers with a narrower, shorter notch separating thicker branches. Preanal appendages longer than high (fig 4, 7) .....
.....2

2a Claspers very sharply curved basally with short terminal branches. Preanal appendages ending in a double hook (fig 4) ... .hoodi Ross p 5

2b Claspers less sharply curved basally with longer terminal branches. Preanal appendages ending in simple lobe (fig 7)..... .....debilis Banks p 5

KEY TO FEMALES

Genitalia formed as a long, slender ovipositor and ending in cerci.

1a Vaginal apparatus ending in a subtriangular head and extended by a median lobe (fig 10).....bernea Ross p 5

1b Vaginal apparatus ending in an oval head almost as long as half the apparatus (fig 9).....hoodi Ross p 5

1c Vaginal apparatus ending in an oval head extending only a third of the length of the apparatus (fig 11).....debilis Banks p 5

Glossosoma (Anagapetus) bernea Ross

Map 1

Anagapetus bernea Ross, 1947 p 131.

Body dark brown, with dark yellow antennae and legs. Head and

pronotum covered with dark golden hairs. Forewings uniformly dark brown. Forewing 4-6 mm long.

Male genitalia (fig 6): segment IX particularly robust with an apico-median, setiferous projection. Preanal appendages shaped like very rounded triangles, distinctly higher than long. Claspers with a very sharp downward curve at their bases. Apical notch deeper than half the length of the appendage, very wide and separating two very regularly slender branches. (Mineral Park, Washington).

Female genitalia (fig 8, 10): vaginal apparatus with a small, subtriangular head extended by a very distinct median lobe. Its base is wrinkled and submembranous. (Diamond Head Trail, British Columbia).

G. bernea ranges from British Columbia to northern California. Its known flight period extends from early June to early August.

Glossosoma (Anagapetus) debilis Ross

Map 1

Agapetus debilis Ross, 1938, p 108.

Body dark brown, with dark yellow antennae and legs. Head and pronotum covered with golden hairs. Forewings uniformly dark brown. Forewing 5-6 mm long.

Male genitalia (fig 7): segment IX distinctly longer ventrally

than dorsally, with apico-lateral edge lacking a distinct projection, but bearing a cluster of bristles. Preanal appendages as slender triangles, ending in simple lobes, and with their inferior edge regularly concave. Claspers of regular width and not very sharply curved basally. Their dorsal edge forms a distinct submedian angle. Apical notch two-fifths as long as the appendage and separating two very robust branches. (Fernie, British Columbia).

Female genitalia (fig 11): vaginal apparatus regularly shaped, with head formed as a simple oval, only a third as long as the part. (Fernie, British Columbia).

G. debilis is the most widely distributed species of the subgenus: British Columbia, Alberta, Washington, Oregon, Idaho, Montana, Utah, Wyoming and Colorado. Its known flight period extends from June to August.

Glossosoma (Anagapetus) hoodi Ross

Map 1

Anagapetus hoodi Ross, 1951, p 143.

Body dark brown, with dark yellow antennae and legs. Head and pronotum covered with dark golden hairs. Forewings brown, with a light spot, indistinct but easily visible, on the anastomosis and the arculus. Forewing 4.5-6 mm long.

Male genitalia (fig 4-5): segment IX simple and regular, with a piliferous apico-lateral projection. Preanal appendages as large

extended triangles, distinctly longer than high, and ending in two simple lobes, angulate or slightly curved into hooks. Claspers rather short and robust, and relatively thin basally where they curve sharply downward. Their dorsal edge is slightly concave over its apical half. Apical notch shallow and separating two short and slender branches. (Marion Forks, Oregon).

Female genitalia (fig 9): vaginal apparatus with a large, regularly oval-shaped head that is almost half as long as the apparatus. (Indigo Springs, Oregon).

G. hoodi is known only from Oregon, Washington, and British Columbia, where it was captured in only two localites, in July.

Subgenus Synafophora Martynov

Synafophora Martynov, 1927, p 165. Type species by original designation: Synafophora minutum Martynov.

Mystrophora Klapalek, 1892, p 19 (preoccupied). Monobasic type species: Mystrophora intermedium Klapalek.

Eomystra Martynov, 1934, p 84. Monobasic type species: Eomystra dulkejti Martynov.

Mystrophorella Kloet and Hincks, 1944, p 97. Nomen novum for Mystrophora Klapalek, 1892, nec Kayser, 1871.

Klapalekia Botosaneanu, 1955, p 792. Nomen novum for Mystrophora Klapalek, 1892.

Midlegs of the female broadened. Anal cells in the forewing of the male with a large callus (fig 12). Internal apical spurs on hindlegs of male thick and curved (fig 21-24). Sternite VI of male with a ventral plate and sternite VII with a large lobe (fig 14).

Male genitalia (fig 13-20): segment IX greatly reduced ventrally. Preanal appendages large and forming blunt lobes or narrowing to spines. Claspers large and horizontal, simple or complex. Aedeagus small with two short spiniferous parameres that project vertically, but are entirely hidden under the preanal appendages. The preanal appendages are connected to the phallotheca by a tendon.

Female genitalia (fig 25-34): segment VIII rather elongate with anterior edge simple and vertical, or deeply notched. Its apical edge is always more or less notched, dorsally, ventrally or laterally. Segment IX sclerotized and clearly visible. Vaginal apparatus large, robust, very long, rather complex, and with an indistinct head.

Synafophora has a wide Holarctic distribution and includes four Canadian species.

KEY TO MALES

Genitalia with two pairs of complex appendages.

1a Claspers multibranched (fig 13, 15).....2

1b Claspers simple (fig 17, 19) 3

2a Claspers three-branched. Preanal appendages with superior lobe bent into a claw (fig 13).....lividum Hagen p 7

2b Claspers two-branched. Preanal appendages without lobe bent into a claw (fig 15).....nigrior Banks p 8

3a Preanal appendages with a spine-shaped superior lobe as long as the appendage. Claspers ending in a regular oval (fig 17, 18).....
.....intermedium Klapalek p 7

3b Preanal appendages with a short, sickle-shaped superior lobe. Claspers ending in an apically truncated oval (fig 19-20)....
.....verdona Ross p 9

KEY TO FEMALES

Genitalia formed as long ovipositor and ending in cerci.

1a Antero-lateral edge of segment VIII deeply and narrowly notched (fig 27-28).....2

1b Antero-lateral edge of segment VIII unnotched (fig 25-26) 3

2a Apico-ventral edge of segment VIII forming two triangular flanges, separated by a deep notch (fig 29). Vaginal apparatus (fig 34).....intermedium Klapalek p 7

2b Apico-ventral edge of segment VIII ending in two flanges that are barely distinct from each other (fig 30). Vaginal apparatus (fig 33).....verdona Ross p 9

3a Apico-lateral edge of segment VIII forming two large subtriangular lobes (fig 26). Vaginal apparatus (fig 32).....
.....nigrior Banks p 8

3b Apico-lateral edge of segment VIII forming two large subrectangular lobes (fig 25). Vaginal apparatus (fig 31).....
.....lividum Hagen p 7

Glossosoma (Synafophora) intermedium Klapalek

Map 2

Mystrophora intermedia Klapalek, 1892, p 19.

Glossosoma (Eomystra) intermedium: Ross, 1956, p 155.

Dorsal part of body dark brown, sparsely covered with golden hairs. Antennae distinctly ringed with reddish-brown. Legs yellow reddish-brown. Forewings dark brown, slightly and indistinctly

spotted with gold. Callus of forewings of male narrow. Internal spur of hindlegs of male (fig 23). Ventral plate of sternite VI of male medium-sized. Forewing 5.5-8 mm long.

Male genitalia (fig 17-18): segment IX short all around and completely open ventrally. Preanal appendages subtriangular, approximately twice as long as high, with the superior apical corner tapering to a triangular point. From the base of the internal basal corner arises a slender, regularly spine-shaped lobe that is as long as the appendage itself. Claspers single-branched, with a slender basal half expanding distally into a long oval that is inwardly concave. Phallic apparatus with aedeagus small, tendon short and broad, and parameres bent and slightly bilobate distally. (Fort Chimo, Quebec).

Female genitalia (fig 28-29, 34): segment VIII shaped like an irregular tube, twice as long as high, with antero-lateral edge deeply cleft around the stigma. Apico-ventral edge of this segment with a rounded notch defining two triangular lobes that are separated from each other by a narrow triangular notch. Vaginal apparatus long and narrow, with a very small head. (Fort Chimo, Quebec).

This species can be easily recognized by the long, slender, pointed process of the preanal appendages and the long, oval apex of the claspers.

G. intermedium is the only species of the subgenus to have a wide Holarctic distribution. Its distribution in North America is Transcontinental and extends south to Illinois and Missouri. This species lives in small, clear, turbulent streams and can be found up

to 1,300 m. The known flight period includes June and July.

Glossosoma (Synafophora) lividum Hagen

Map 2

Tinodes livida Hagen, 1861, p 295.
Glossosoma americanum Banks, 1897, p 31.
Glossosoma (Eomystra) lividum: Ross, 1956, p 155.

Body uniformly reddish-brown, sparsely covered with golden hairs. Antennae with faint light rings. Forewings uniformly light reddish-brown. Anal callus of forewings of male large and subcircular (fig 12). Internal spur of male hindlegs (fig 21). Ventral plate of male sternite VI especially large (fig 14). Forewing 6-8 mm long.

Male genitalia (fig 13): segment IX short all around and open ventrally. Preanal appendages not very large, very rounded with a superior subapical lobe that is stout, claw-like, and curved downward. Claspers very large, longer than the preanal appendages, and three-branched. The superior and inferior branches are thin and spine-shaped, while the median branch is slightly spatulate and denticulate distally. Aedeagus blunt. Parameres and tendons shaped like long ovals. (Montreal, Quebec).

Female genitalia (fig 25, 31) segment VIII approximately one and a half times as long as high, with anterior edge simple. Apical edge

forming a large, square, lateral lobe and a deep ventral notch. Vaginal apparatus with a wrinkled base that is possibly erectile, and with a head two-thirds as long as the apparatus. (Montreal, Quebec).

This species can be recognized by its pale colouration, the three branches of its claspers, and the claw-like lobe on its preanal appendages.

G. lividum has been reported only from Quebec and Ontario. It appears sporadically, although it is sometimes abundant locally near medium- and large-sized rivers. Its known flight period extends from late May to late September.

Glossosoma (Synafophora) nigrior Banks

Map 3

Glossosoma nigrior Banks, 1911, p 355.
Mystrophora americana Betten, 1934, p 140.
Eomystra unica Denning, 1942, p 46.

Dorsal portion of body dark reddish-brown, sparsely covered with golden hairs. Antennae reddish-brown, faintly ringed with yellow. Dark yellow-russet legs. Forewings dark brown, with faint and indistinct light spots. Anal callus of male forewings triangular and not very large. Internal spur of male hindlegs (fig 24). Plate of male sternite VI medium-sized. Forewing 6.5-8.5 mm long.

Male genitalia (fig 15-16): segment IX very elongate dorsally with apico-lateral edge distinctly concave at the level of the claspers and completely open ventrally. Shape of preanal appendages very complex and indescribable. Their apico-ventral edge is concave and greatly complicated by many small, setiferous lobes. Claspers two-branched. Both branches subparallel, setiferous, long and rod-shaped. External basal half of the superior branch forming a large, angular transversal flange. Phallic apparatus with slender aedeagus and long, thin parameres and tendons. (Bradore Bay, Quebec).

Female genitalia (fig 26, 32): segment VIII slightly longer than high, with its antero-lateral edge oblique and apico-lateral edge forming a large, blunt lobe. Vaginal apparatus with a short, barely distinct head. (St John's, Newfoundland).

This species is recognized by the complex shape of its preanal appendages and by the two branches of its claspers.

G. nigrior is widely distributed in the north and the east of the continent: Newfoundland, Quebec, Ontario, Michigan, Minnesota, New Hampshire, Massachusetts, Virginia, Maryland, Tennessee, Georgia, North Carolina and South Carolina. It lives in a large variety of flowing waters, from small, rapid streams to large rivers. The known flight period extends from early May to late November.

Glossosoma (Synafophora) verdona Ross

Map 3

Glossosoma verdona Ross, 1938, p 110.

Glossosoma verdona: Nimmo, 1974, p 325.

This species is very similar to intermedium from which it can be distinguished mainly by its genital characters. Posterior internal spur of male hindlegs (fig 22). Forewing 6-7 mm long.

Male genitalia (fig 19-20): segment IX robust and fairly elongate, especially dorsally, but not completely open ventrally. Preanal appendages almost as high as long, rounded and with superior apical corner forming a very blunt point. From the middle of the superior internal edge projects a sickle-like lobe curved downward, parallel to, and with the same curvature as, this edge. Claspers single-branched, with the basal half robust and cylindrical and the apical half greatly expanded, inwardly concave, and truncated at a right angle distally. Phallic apparatus with aedeagus similar to intermedium, but with a long, slender tendon, and parameres less bent and not bilobate distally. (Crow's Nest, British Columbia).

Female genitalia (fig 27, 30, 33) with segment VIII having the same proportions as intermedium and the same antero-lateral notch. The apico-ventral notch is much less marked and separates two lobes that are barely distinct from each other. Vaginal apparatus somewhat larger than those of the other species, with a blunt and distinct head. (Togwotee Pass, Wyoming).

This species can be distinguished from intermedium by the

characters described above.

G. verdona has been reported from British Columbia, Alberta, Alaska, Utah, Wyoming, Montana, Oregon, California, and New Mexico. It lives in clear and rapid streams, between 900 and 1,300 m. The known flight period extends from May to July. It has not been collected frequently in Canada, except in Alberta.

Subgenus Anseriglossa Ross

Anseriglossa Ross, 1956, p 157. Type species by original designation: Glossosoma penitum Banks.

Female midlegs broadened. Anal cells of the male forewings with a large callus covered with scaly, erect hairs. Discoidal cell of forewings especially long. Male hindwings with costal edge deeply concave and bearing a thick fringe of yellow hairs. Male sternite VI with a large oval plate.

Male genitalia (fig 35-36): segment IX reduced laterally and also ventrally, where it forms three asymmetrical lobes. Preanal appendages extended as simple, elongate, oval lobes. The phallotheca is connected to the bases of the preanal appendages by two stout tendons, to which are attached two very prominent appendages, which are expanded and pointed distally, and which flank the aedeagus. The aedeagus is asymmetrical, very long, and flattened dorso-ventrally, then tapered distally. It lacks parameres but bears stout apical spines, on the left side only. Claspers missing.

Female genitalia (fig 38-39): segment VIII shaped like a rather short, truncated cone with rather complex lateral faces and with its apical edge not very notched. Segment IX entirely membranous and virtual. Vaginal apparatus elongate, robust, simple, and well sclerotized, without an apical head.

Anseriglossa consists of only one species.

Glossosoma (Anseriglossa) penitum Banks

Map 4

Glossosoma penitum Banks, 1914, p 202.
Glossosoma (Anseriglossa) penitum: Ross, 1956, p 157.

Body blackish brown with concolorous antennae and dark reddish-brown legs. Head and pronotum covered with golden hairs. Forewings dark brown with clearly visible, but poorly demarcated, light zones in the post-costal area and on the anastomosis. Forewing 4-8.5 mm long.

Male genitalia: figure 35-36 (Wellington, British Columbia).

Female genitalia: figure 38-39 (Ibid).

This species is very distinct from the other species in the

genus by virtue of its genital characters.

G. penitum is widely distributed in western North America: British Columbia, Alaska, Washington, Oregon, Idaho, and California. It lives mainly in small, rapid streams, and its known flight period extends from May to October.

Subgenus Ripaeglossa Ross

Ripaegloss Ross, 1956, p 152. Type species by original designation: Glossosoma parvulum Banks.

Female midlegs broadened. Anal cells of male forewings broadened, with a large circular callus. Male sternite VI with a large oval plate, and sternite VII with a blunt lobe.

Male genitalia (fig 40-60): apico-lateral edge of segment IX extended far posterad to form an often translucid capsule that almost entirely encloses the genital parts. Segment X less strongly reduced than in the other subgenera and bearing a bifid median sclerite. Preanal appendages prominent, always curved upward, generally small, but sometimes long and whip-like, and emerging from the genital capsule. Claspers large and horizontal, and always projecting from the capsule. Aedeagus very long, sometimes with short, thick parameres, and sometimes linked to the base of the claspers by a connecting lobe, depending on the group the species belongs to. In addition, sometimes there are two slender, membranous lobes under the parameres.

Female genitalia (fig 61-84): segment VIII variable in length, with anterior edge simple and apical edge always cleft dorsally, laterally, or ventrally. Segment IX sometimes sclerotized, but generally entirely membranous and virtual. The membrane that connects segments VIII and X is not attached to the apical edge of segment VIII, but within segment VIII, as in many of the Rhyacophila. The insertion line is so fine that it is invisible, and it is not shown in figures 69-76. Segments X and XI without distinguishing characters. Vaginal apparatus long, slender and fishbone-shaped, swollen at the tip, sometimes with a dorsal part of very variable length specifically.

Ripaeglossa includes the only species of Trichoptera whose genital structures are contained in a true capsule. This subgenus is exclusively western Nearctic. A half-dozen species have been reported in Canada, but this number will certainly rise in the near future. These species are generally found near large, turbulent rivers.

KEY TO MALES

Genitalia enclosed in a chitinous capsule.

1a Preanal appendages very long, slender, and rod-shaped, broadly arched within the capsule, but with distal end free (fig 40-42) 2

1b Preanal appendages short and robust, with at most their tip protruding from the capsule (fig 44, 46) 4

2a Distal end of preanal appendages with an oval head and bearing a stout, spur-shaped spine and several very short spines (fig 42) .....pyroxum Ross p 14

2b Distal end of preanal appendages slender and bearing a single, thin spine (fig 40-41) 3

3a Claspers with dorsal edge appearing convex and inferior edge appearing straight in lateral aspect (fig 40) ....alascense Banks p 12

3b Claspers with dorsal edge appearing straight and inferior edge appearing convex (fig 41) ....wenatchee Ross and Spencer p 16

4a Claspers distinctly curved upward distally (fig 43, 49) 5

4b Claspers slightly or not curved (fig 47-48) 6

5a Claspers appearing long and rectangular in lateral aspect with their inferior apical corner curved into a claw (fig 49) .....traviatum Banks p 15

5b Claspers appearing gradually thinner with a slender and curved distal end (fig 43) .....excitum Ross p 12

6a Claspers appearing as large ovals approximately twice as long as high (fig 48) .....schuhi Ross p 14

6b Claspers more or less shaped like irregular rods, more than twice as long as high (fig 44-45) 7

7a Claspers long, slender and somewhat thickened distally (fig 45) .....parvulum Banks p 13

7b Claspers shorter and not slender distally (fig 44, 47) 8

8a Claspers barely longer than the capsule and very blunt distally (fig 44) .....velona Ross p 15

8b Claspers more elongate and tapering distally (fig 46-47).....9

9a Superior basal spine of preanal appendages as long as the appendage. Claspers twice as high basally as over the rest of the appendage (fig 46) .....montana Ross p 13

9b Superior basal spine of preanal appendages distinctly shorter than these appendages. Claspers slightly higher basally than over the rest of their length (fig 47) .....idaho Ross p 13

KEY TO FEMALES

Genitalia formed as a long ovipositor ending in two cerci.

1a Vaginal apparatus shaped like a single very long, simple, slender rod (fig 61-63) 2

1b Vaginal apparatus made up of two complex parts (fig 64-68).....4

2a Segment VIII more than twice as long as high (fig 69). In ventral aspect, it appears to end in two dorsal lobes and two rounded ventral lobes of subequal size (fig 77) .....
.....alascense Banks p 12

2b Segment VIII not as long and ending in differently shaped lobes 3

3a Segment VIII with a distinct lateral notch (fig 70). In ventral aspect, the apical lobes appear rather angular (fig 78) .....
.....wenatchee Ross and Spencer p 16

3b Segment VIII with an indistinct lateral notch (fig 71). In ventral aspect, the dorsal and ventral edges appear very deeply cleft (fig 79) .....pyroxum Ross p 14

4a Vaginal apparatus made up of a small dorsal part and a ventral part that is three times as long as the dorsal part (fig 64). Segment VIII completely open ventrally (fig 72, 80) .....
.....excitum Ross p 12

4b Vaginal apparatus made up of two parts of subequal length (fig 65-68). Segment VIII closed ventrally (fig 81-84) 5

5a Segment VIII with lateral faces discontinuous and apparently made up of two parts (fig 73-74) 6

5b Segment VIII with lateral faces continuous (fig 75-76) 7

6a Ventral flange of segment VIII a large triangle that is clearly incised apically (fig 81) .....velona Ross p 15

6b Ventral flange of segment VIII a depressed triangle that is barely cleft apically (fig 82) .....parvulum Banks p 13

7a Segment VIII with ventral face clearly sinuous and very oblique dorsad (fig 76), and with apical edge not forming distinct lobes (fig 84).....traviatum Banks p 15

7b Segment VIII with ventral face barely sinuous and barely oblique dorsad (fig 75), with apical edge clearly incised ventrally (fig 83) .....montana Ross p 13

Glossosoma (Ripaeglossa) alascense Banks

Map 5

Glossosoma alascence Banks, 1900, p 472.

Glossosoma pterna: Radford and Hartland-Rowe, 1971, p 893.

Glossosoma (Ripaeglossa) alascence: Nimmo, 1974, p 320.

Body dark brown, with yellow reddish-brown antennae and legs. Head and pronotum covered with golden hairs. Forewings dark brown, with a few indistinct golden spots in the anal area and on the arculus and anastomosis. Plate of male sternite VI large and almost as wide as long. Forewing 6-7.5 mm long.

Male genitalia (fig 40, 50): segment IX conspicuous by its massive development and almost twice as long as high. Preanal appendages long, whip-like, and rather regularly slender, for the most part curved upward in the capsule, and with the apical half free. They bear a long, slender apical spine. Aedeagus very slender, as long as the capsule and lacking parameres. Claspers with superior edge mostly convex and inferior edge straight. In posterior aspect, the claspers appear rather complex, since their inferior edge is folded into an L-shape facing inward. In ventral aspect, they appear very robust and approximately three times as long as wide. (Paratype from Popoff Island, Alaska).

Female genitalia (fig 61, 69, 77): segment VIII more than twice as long as high. Its ventral face is concave, and its apical edge is cleft in such a way that it forms four rounded lobes, of subequal size and each quite distinct from the others. Segment IX virtual and entirely desclerotized. Vaginal apparatus made up of a single part, very long and slender with an inconspicuous head. (Paratype from Popoff Island, Alaska).

This species is recognized by the large size of the genital capsule and the longitudinal right-angled folding of the claspers

into an L-shape.

G. alascense has a very wide distribution, extending from Alaska to Utah and from Montana to Oregon. It lives in a rather wide variety of habitats, from large, very turbulent torrents to rapid and smoothly flowing plains rivers to rather slowly flowing creeks. The known period of flight extends from early May to late August, peaking in July. In altitude, it has been found from 700 to 2,000 m.

I believe Radford and Hartland-Rowe's report of pterna in Alberta to be the result of an error in identification, for geographical as well as taxonomic reasons.

Glossosoma (Ripaeglossa) excitum Ross

Map 5

Glossosoma excita Ross, 1938, p 109.

Body brown to dark brown, with light yellow antennae and legs. Head and pronotum covered with light golden hairs. Forewings light brown, with a few indistinct spots in the anal area, and on the arculus and anastomosis. Plate of male sternite VI large, but distinctly less wide than long. Forewing 5-7 mm long.

Male genitalia (fig 43, 53): segment IX forming a medium-sized capsule. Preanal appendages thick and cylindrical, rather long, regularly curved upward and entirely hidden in the capsule. Aedeagus large and slender, lacking parameres and projecting past segment IX

anterad and posterad. Claspers very high basally, tapering to the apex, which is slender, curved upward, and endowed with a triangular flange in the concavity thus formed. In ventral aspect, they appear wide, robust, and rather complex. (Allison Pass, British Columbia).

Female genitalia (fig 64, 72, 80): segment VIII very clearly longer than high, with a slightly concave, and completely open, inferior face. Apical edge forming two dorso-lateral lobes and two slight inferior lobes. Segment IX desclerotized and virtual. Vaginal apparatus made up of a long, rather stout ventral part, with a small dorsal part that is one quarter the length of the ventral part. (Metolius River, Oregon).

This species is easily recognized by its long robust cylindrical preanal appendages and by its claspers, which are very high basally and curved distally.

G. excitum lives in British Columbia and the states of Washington, Oregon, and Montana.

Glossosoma (Ripaeglossa) idaho Ross

Glossosoma idaho Ross, 1941, p 41.

This species is very similar to montana from which it differs only with respect to a few details of the male genital structure (fig 47). Superior lateral portion of the capsule less blunt. Preanal appendages distinctly thicker and more angular, with basal spur much

shorter. Claspers somewhat thinner and more slender, with their basal portion less thick and the cluster of internal apical bristles less developed. (Original drawing from Ross, 1941). Female unknown.

G. idaho has been collected only in a few localities in Idaho and Montana.

Glossosoma (Ripaeglossa) montana Ross

Glossosoma montana Ross, 1941, p 42.

Small very dark species, with blackish forewings and indistinct light spots. Plate of male sternite VI narrow and three times as long as wide. Forewing 5.5-6 mm long.

Male genitalia (fig 46, 56, 60): segment IX forming a capsule that is not very large and not very wide distally. Preanal appendages large, thick, and reniform with a long slender curved lash-shaped basal spine. Aedeagus not greatly thickened distally. Parameres short, thick and partially desclerotized, with well developed membranous inferior lobes. Claspers stout and thick, twice as high basally as over the remaining length and with a distinct cluster of thick internal subapical bristles. In ventral aspect, the claspers appear rather stout and slightly sinuous. (Varney, Montana).

Female genitalia (fig 65, 75, 83): segment VIII somewhat shorter than high with its dorsal face longer than its ventral face. It forms slight apical lobes and bears a small triangular ventral median

notch. Segment IX distinctly sclerotized. Vaginal apparatus made up of two parts, of subequal length, but rather different shapes. The ventral part is slender and slightly curved distally. (Varney, Montana).

This species is very similar to idaho and parvulum. It can be distinguished from these two by the long slender spur at the base of the preanal appendages and the proportions of the claspers.

G. Montana has been collected in the states of Washington, Oregon, Idaho, and Montana.

Glossosoma (Ripaeglossa) parvulum Banks

Glossosoma parvula Banks, 1904a, p 108.
Glossosoma (Ripaeglossa) parvulum: Ross, 1956, p 153.

Body dark brown, with antennae uniformly light reddish-brown and legs concolorous. Head and thorax covered with golden hairs. Forewings dark brown, with indistinct light spots. Plate of male sternite VI small and twice as long as wide. Forewing 5-6 mm long.

Male genitalia (fig 45, 55, 59): segment IX forming a well developed capsule dorso-laterally. Preanal appendages large, thick, and bent at an obtuse angle, with a short basal spine. Aedeagus rather strongly thickened over its apical third, with slender, sinuous parameres and two very slender, membranous appendages.

Claspers long and slender, thickened basally only, oval distally, bearing a dense cluster of stout bristles on their inside face. In ventral aspect, the claspers appear slender and rather regular. (Provo River, Utah)

Female genitalia (fig 66, 74, 82): segment VIII forming two large, rounded apico-lateral lobes that define the ventral face as a short plate that is barely cleft distally, bearing a pronounced triangular median keel. Segment IX relatively well sclerotized. Vaginal apparatus made up of two parts of subequal size. Ventral part curved downward with a distinct head.(Provo River, Utah).

This small species is recognized mainly by the slender shape of its claspers.

G. parvulum has been reported from the Rocky Mountains, from Idaho and Montana to New Mexico, and does not appear to penetrate the Cascade Range. It has not yet been reported in Canada.

Glossosoma (Ripaeglossa) pyroxum Ross

Map 6

Glossosoma pyroxum Ross, 1941, p 42.

This species is very similar to alascense and wenatchee, and it can be distinguished by the following characters:

Male genitalia (fig 42, 52): segment IX forming a slightly smaller capsule. Preanal appendages not as long, not as slender, and

distinctly thickened over their basal third, ending in a distinct oval head bearing a large apical spur and short, rather stout spines. Claspers simple with superior edge straight and inferior edge convex, as in wenatchee, but they are more slender, less blunt distally, and, in ventral aspect, sharply curved laterally at their base. (Sayward, northern Vancouver Island, British Columbia).

Female genitalia (fig 63, 71, 79): segment VIII appearing poorly delimited at its inferior basal corner. Its apical edge forms a large, angular superior lobe. In ventral aspect, these lobes ressemble very long ovals separated by a deep v-shaped cleft. The ventral edge also bears a v-shaped cleft, but even larger and extending nearly half the length of the segment. Segment IX completely desclerotized and virtual. Vaginal apparatus very similar to that of wenatchee, but not as long, and with an even more distinct head. (Sayward, northern Vancouver Island, British Columbia).

This species is distinguished from its two close relatives mainly by its less slender and apically spiniferous preanal appendages.

G. pyroxum has been collected in British Columbia, Washington, and Oregon. It appears to be abundant in Oregon, where its life cycle was studied by Anderson (1976).

Glossosoma (Ripaeglossa) schuhi Ross

Glossosoma schuhi Ross, 1947, p 130.

Body dark brown, with light brown antennae and legs. Head and pronotum covered with golden hairs. Forewings dark brown, with a few traces of lighter spots on the anastomosis and the arculus. Plate of male sternite VI medium-sized and distinctly longer than wide. Forewing 6-7.5 mm long.

Male genitalia (fig 48): segment IX forming a medium-sized capsule with its apico-lateral edge slightly concave. Preanal appendages shaped like long straight rods. Aedeagus lacking parameres, very thick, scythe-like and sharply curved downward, and ending in a small spine-shaped point. Claspers large and oval, with a pronounced basal heel, tapering toward the apex, which is sharp and slightly curved upward and inward. (Original figure from Ross, 1947). Female unknown.

This species belongs to the same group as excitum and traviatum from which it can be distinguished by the larger and thicker aedeagus and the barely curved claspers.

G. schuhi is still known only in Oregon and Idaho.

Glossosoma (Ripaeglossa) traviatum Banks

Glossosoma traviatum, Banks, 1936, p 266.
Glossosoma (Ripaeglossa) traviatum: Ross, 1956, p 154.

Body and wing colouration similar to other species in the subgenus. Plate of male sternite VI large but distinctly narrower than long. Forewing 6.5-7.5 mm long.

Male genitalia (fig 49, 57): segment IX forming a rather short capsule that is well rounded ventrally. Preanal appendages slender and cylindrical, not very long, barely curved, and oblique upward. Aedeagus without parameres, short, thick mainly at its base, regularly slender to its extremity, curving downward, and ending in two small points. Claspers robust and regularly rectangular in lateral aspect, with superior apical corner broadly rounded and the inferior apical corner claw-like and narrowly curved upward. In ventral aspect, they appear wide and irregularly sinuous. (Pendleton, Oregon).

Female genitalia (fig 68, 76, 84): segment VIII approximately as long as high, without apical lobes, but with its ventral face sinuous and very oblique upward. Segment IX completely desclerotized or virtual. Vaginal apparatus made up of a large, robust dorsal part, contiguous with a very slender, simple ventral part. (Pendleton, Oregon).

This species is similar to excitum and schuhi and can be easily distinguished from these by the shape of its claspers.

G. traviatium is widely distributed in Oregon, Washington, Idaho, Montana, and Wyoming, but has not yet been collected in Canada.

Glossosoma (Ripaeglossa) velona Ross

Map 6

Glossosoma velona Ross, 1938, p 109.

Glossosoma (Ripaeglossa) velona: Nimmo, 1974, p 319.

Body dark brown, with reddish-brown antennae and legs. Head and pronotum covered with light golden hairs. Forewings dark brown, with pronounced light spots in the post-costal area, on the anastomosis and especially on the arculus. Plate of male sternite VI small and approximately three times longer than wide. Forewing 5-7.5 mm long.

Male genitalia (fig 44, 54, 58): segment IX forming a rather regularly short capsule. Segment X directed vertically. Preanal appendages shaped as large blunt lobes, bent posterad at right angles and bearing a pronounced spur-shaped basal spine. Aedeagus medium-sized and slightly swollen distally, with a pair of parameres shaped like very stout spurs; these extend beyond the claspers ventrad and are more heavily sclerotized than the latter. There are also two long slender membranous appendages located ventrally. Claspers prominent, thick and extending barely past the edge of the capsule. High basally, they narrow by half at mid-length and are truncated at right angles distally, where they bear a dense internal cluster of stout bristles. The claspers appear broad in ventral aspect. (Okanagan Falls, British Columbia).

Female genitalia (fig 67, 73, 81): segment VIII rather strongly sclerotized and of complex shape. This segment has three very large apico-lateral lobes that define the ventral face, forming a large triangular plate that is distinctly cleft distally, and which bears a pronounced linear median keel. Segment IX relatively well sclerotized. Vaginal apparatus made up of two parts of subequal size and similar shape distally. (Okanagan Falls, British Columbia).

This species is recognized by the small size of its genital capsule and by its short and truncated claspers.

G. velona has a large distribution area extending from the Northwest Territories to Utah and from Montana to the Pacific Coast. This species lives mainly in the less turbulent parts of large rivers and occasionally in smaller and less rapid streams. The known period of flight extends from early April to mid-November, with an apparent peak in July.

Glossosoma (Ripaeglossa) wenatchee Ross and Spencer

Map 6

Glossosoma wenatchee Ross and Spencer, 1952, p 45.

This species is very similar to alascense, with which it shares many characters, in particular, the long, very slender, and broadly curved preanal appendages. It can be distinguished from alascense by

the following features.

Male genitalia (fig 41, 51): segment IX somewhat less elongate and forming a slightly smaller capsule. Aedeagus a little shorter. Claspers less broad. In lateral aspect, their superior edge appears straight and their inferior edge convex. They are narrow and not folded inwards into an L-shape. In ventral aspect, they appear thin and slender with a very slim and barely curved base. (Mazama, Washington).

Female genitalia (fig 62, 70, 78): segment VIII somewhat less elongate than in alascense, with its inferior face less concave, and its apical edge forming lobes that are more angular. Vaginal apparatus slightly less elongate and with a more distinct head. (Winthrop, Washington).

This species differs from alascense mainly by its more slender and simpler claspers.

G. wenatchee has been reported from British Columbia, Yukon Territory, Washington, and Oregon.

Subfamily Agapetinae Martynov

Agapetinae Martynov. 1913, p 11. Type genus: Agapetus Curtis.

This subfamily has only one Canadian genus.

Genus Agapetus Curtis

Agapetus Curtis, 1834, p 217. Type species designated by Westwood, 1840: Agapetus fuscipes Curtis.

Spurs 2, 4, 4. Second article of maxillary palpi particularly globular. Midlegs of female flattened and densely ciliated. In the male, the internal gland of sternite V is spherical and very large, but with secondary complications; its walls are thick and it opens laterally by means of a narrow slit. Sternite I with a long ventral appendage, which is much smaller in the female (fig 86). Forewings regularly oval, with complete venation. Hindwings distinctly smaller and narrower, with venation somewhat reduced. Venation (fig 85): in the forewings, R1 is not divided distally and the R1-R2+3 crossvein is missing. The venation is otherwise similar to that of Glossosoma, with the discoidal cell triangular and somewhat oblique. In the hindwings, R1 ends at R2+3, near the origin of the latter. Discoidal cell open, anastomosis located in the middle of the wing, and A3 ending at A2 right at the base of the wing.

Male genitalia (fig 87-94): segment IX very robust, although occasionally reduced dorsally. Segment X voluminous and forming a large concave roof which covers the phallic apparatus; most of its surface is membranous, but it is reinforced by two large inferior lateral chitinous ribs and ending in diverse points. Intermediate appendages completely missing. Preanal appendages long and free. Claspers large, uni-articulate, horizontal, inermous or bearing teeth. Phallic apparatus very long and slender, made up of an

aedeagus and two asymmetrical parameres; these three structures are contiguous.

Female genitalia (fig 95-103) extended into an ovipositor of medium length with apodemal straps. Segment VIII whole and flattened laterally, with its apical edge slightly or not incised. Inter-segmental membrane VIII-X invaginated into segment VIII to a point anterad of the anterior edge of this segment and distinctly sclerotized within this segment. Segment VIII thus appears as two cylinders, one encased in the other. Segment IX entirely desclerotized and virtual. Segment X membranous, but with a chitinous dorso-lateral reinforcement. Segment XI ovoid, with a concave inferior face and bearing biarticulate cerci with two subequal, long, and very slender articles. Vaginal vestibule short. Vaginal apparatus small, simple, and not very chitinous. It is probably capable of slight outward evagination during mating. The vaginal apparatus does not provide good specific characters.

Agapetus is a large-sized genus found in the Holarctic, Oriental, and Australian regions, and at high altitudes in Africa. Some thirty species live in Nearctic North America, but only four of these are Canadian. The latter are limited to the cold, running waters of the central and eastern regions of the country. These are small, rather hairy, greyish-brown insects that can only be identified by their genital parts.

Genitalia made up of fairly complex parts.

1a Claspers more than four times as long as high. Preanal appendages arising from upper lateral faces of segment X. (fig 92, 94) 2

1b Claspers approximately twice as long as high. Preanal appendages projecting from lower lateral faces of segment X (fig 91, 93) 3

2a Preanal appendages very long, slender, and straight. Superior edge of claspers sinuous and inferior edge straight (fig 92) .....iridis Ross p 18

2b Preanal appendages thick, rather pronounced, and curved upward. Superior edge of claspers straight and inferior edge somewhat sinuous (fig 94) ..... pinatus Ross p 19

3a Claspers distinctly thinner at their base than at their apex, which is broadly rounded (fig 93) .....rossi Denning p 19

3b Claspers barely thinner at their base than at their apex, which is angulate (fig 91) .....hessi Leonard and Leonard p 18

Genitalia formed as a not very elongate ovipositor and ending in two long cerci.

1a Inferior basal corner of segment VIII forming a large prominent convex lobe (fig 99) ..... hessi Leonard and Leonard p 18

1b Inferior basal corner of segment VIII not forming such a lobe..2

2a Inferior half of anterior edge of segment VIII broadly concave (fig 101).....rossi Denning p 19

2b Inferior half of anterior edge of segment VIII not forming such a concavity 3

3a Apical edge of segment VIII not notched and strongly oblique downward (fig 100) .....pinatus Ross p 19

3b Apical edge of segment VIII with a distinct notch and not strongly oblique (fig 102) .....iridis Ross p 18

Agapetus hessi Leonard and Leonard

Map 7

Agapetus hessi Leonard and Leonard, 1949, p 1.

Gland of male sternite V large and complex. Lobe of male sternite VI very large and pronounced, extending almost to the apex

of segment VII (fig 86). Forewing 4.5-6 mm long.

Male genitalia (fig 87, 91, 95): segment IX strongly developed laterally and ventrally, but short dorsally with its apico-lateral edge angular and oblique. Preanal appendages thick, blunt distally, curved downward, and densely ciliated on their internal face. Segment X large, high, with a lateral and dorsal basal chitinous thickening visible in lateral aspect only. It is reinforced by two long, slender ribs, diverging distally and bearing one or two apical spines. Claspers appear subrectangular in lateral aspect, barely higher distally than basally, and angular apically. Their apical edge is somewhat variable and forms a triangular tooth under which is a stout spine. Their internal face is rather deeply concave. (Ile de Ste-Hélène, Montreal, Quebec).

Female genitalia (fig 99, 103): segment VIII irregularly shaped, with its dorsal edge shorter than its ventral edge, and its anterior and posterior lateral edges convex and oblique. Inferior basal corner extended into a pronounced convex lobe to which is attached the apodemal strap. Invagination of inter-segmental membrane VIII-X extended anterad by two flanges with slight vertical striations. (Ile de Ste-Hélène, Montreal, Québec).

This species is closely related to rossi from which it can be distinguished mainly by the shape of its claspers.

A. hessi has been collected in Quebec, Ontario, Michigan, and Virginia.

Agapetus iridis Ross

Map 7

Agapetus iridis Ross, 1944, p 269.

Gland of male sternite V small, with a long slit-like opening similar to that of a cowrie. Lobe of male sternite VI small and slender. Forewing 3.5-5.5 mm long.

Male genitalia (fig 88, 92, 96): segment IX strongly developed all around, with its superior apical corner sharp and prominent, and its apico-lateral edge vertical and straight. Preanal appendages located very high, slightly above segment X, very long and slender, straight, and with long cilia along the superior edge. Segment X not sclerotized dorsally, reinforced by two rather slender ribs ending in two sharp teeth in a vertical plane. The two ribs sometimes cross apically at their extremity. Claspers very long and slender, five times longer than high, with their superior edge sinuous and their inferior edge straight. In ventral aspect, the inferior edge appears almost straight and forms a simple median projection. (Great Smoky Mts Nat Park, North Carolina).

Female genitalia (fig 102): segment VIII appearing massive and subrectangular in lateral aspect, with anterior edge straight and vertical, and apical edge forming a large rounded flange, overhanging a distinct subcircular notch. (Great Smoky Mts Nat Park, North Carolina).

This species is rather closely related to pinatus from which it can be distinguished by its higher and more slender preanal appendages, by the more pronounced apex of its segment X, and the internal texture of its claspers.

A. iridis has been recorded from Quebec and the states of New York and North Carolina.

Agapetus pinatus Ross

Map 7

Agapetus pinatus Ross, 1928, p 107.

Gland of male sternite V large and complex. Lobe of male sternite VI small and slender. Forewing 4.5-5.5 mm long.

Male genitalia (fig 90, 94, 97): segment IX very well developed all around, with its superior apical corner straight and its apico-lateral edge vertical and straight. Preanal appendages arising from upper lateral faces of segment X, robust, distinctly arched dorsad and with long cilia along their superior edge. Segment X not sclerotized dorsally and reinforced by two stout inferior lateral chitinous ribs, ending in two concave, divergent triangles bearing minute teeth. Claspers very long and slender, more than four times longer than high, with their dorsal edge straight and their ventral

edge somewhat sinuous. In dorsal aspect, their inferior edge seems to form a large rounded flange followed by two small chitinous teeth. (Baddeck, Nova Scotia).

Female genitalia (fig 100): segment VIII with dorsal edge twice as short as ventral edge, since the anterior and posterior edges are strongly oblique ventrad. Apical edge forming a distinct obtuse corner, but not notched. (Baddeck, Nova Scotia).

This species is especially similar to iridis from which it can be distinguished by its stouter preanal appendages, the apex of its segment X, and the internal texture of its claspers.

A. pinatus has been collected in Nova Scotia, New Brunswick, Quebec, and Tennessee.

Agapetus rossi Denning

Map 7

Agapetus rossi Denning, 1941, p 200.
Agapetus rossi: Leonard and Leonard. 1949, pl 1.

Gland of male sternite V large. Lobe of male sternite VI medium-sized and blunt distally. Forewing 4.5-5.5 mm long.

Male genitalia (fig 89, 93, 98): segment IX pronounced laterally and ventrally, but short dorsally with its apico-lateral edge regular

and vertical. Preanal appendages stout, thick, pointed distally, curved like a scythe ventrad, and with long cilia along their inferior edge. Segment X large, not very high, with a dorsal chitinous thickening visible in lateral aspect only. It is reinforced by two inferior lateral chitinous ribs, which are rather stout, thickened distally, where they are divergent, and ending in a stout spine. In addition, there are one or two subbasal lateral teeth, directed outward. Claspers distinctly lower basally than distally. The distal portion is very broadly rounded, but with a circular notch and a blunt tooth disrupting the regularity of the curve. In dorsal aspect, the claspers appear to end in a minute tooth, and their internal ventral edge appears very convex. (Masham Mills, Quebec).

Female genitalia (fig 101): segment VIII with the inferior half of its anterior edge strongly concave and the insertion point of the apodemal strap located rather high laterally. Dorsal edge of segment shorter than ventral edge. Anterior and posterior lateral edges simple and oblique. The invagination of inter-segmental membrane VIII-X is extended anterad by two simple rounded flanges. (Masham Mills, Quebec).

This species is very similar to hessi from which it can be distinguished mainly by the distinctly more rounded shape of the claspers and the presence of inferior subbasal spines on segment X.

A. rossi has been recorded from Nova Scotia, Quebec, Ontario, Minnesota, and Virginia.

Agapetus walkeri Betten and Mosely

Beraea? *obscura* Walker, 1852, p 121. *pro parte*.
Synagapetus *walkeri* Betten and Mosely, 1940, p 7.
Agapetus *walkeri*: Ross, 1956, p 164.

This species is known only by a female from Walker's original series which originated from St Martin's Falls, Albany River, Hudson Bay, Ontario. This series included two specimens described by the English author under the name of *Beraea?* *obscura*. This species has since been reassigned to the genus *Chimarra*. The second specimen was assigned to the genus *Synagapetus* under the name *walkeri*. Betten and Mosely unfortunately provided no characters by which this species could be recognized; it therefore remains a *nomen nudum*, but it is really a synonym for one of the preceding species.

Subfamily Protoptilinae Ross

Protoptilinae Ross, 1956, p 127. Type genus: *Protoptila* Banks.

These are very small species (length of forewing 2.75-4 mm) with both wings narrow and pointed, and with rather long fringes. The Protoptilinae thus superficially ressemble the Hydroptilidae, but can be distinguished from them by characters such as the ocelli being located far from the edge of the eye, by the antennae being longer, by the absence of erect hairs on the forewing, and by the straight

anastomosis of this wing. The colouration of the wings is uniformly dark, with a white transversal line on the anastomosis. The face of these insects is very constant and uniform. Spurs 0, 4, 4 or 0, 3, 3. Midlegs of the female unflattened. Venation (fig 104): in the forewings, discoidal cell present and closed, and median cell open. Veins of the anastomosis aligned. Forks 1, 2, and 3 or 1, 2, 3, and 4 present. F1 especially wide. In the hindwings, the venation is indistinct, with forks 2, or 2 and 3 present.

Male genitalia: tergite and sternite VIII extensively confluent and enlarged. Segment IX smaller than segment VIII and completely enclosed within the latter. Segment X membranous and slightly or not visible. Preanal appendages rather prominent, simple or bipartite, and curved downward. Claspers absent or no longer recognizable as such. Phallic apparatus very large and complex, sometimes greatly modified.

Female genitalia not extended into an ovipositor and hence lacking apodemal straps. Segment VIII massive. Segment IX completely missing or virtual. Segments X and XI fused into large lobes with apical cerci; the cerci are well developed and uniarticulate. Vaginal apparatus simple or complex, and always large.

The Protoptilinae are very widely distributed in the Nearctic and Neotropical regions of the Americas and include a few genera in Palearctic and Oriental Asia. In Canada, they are represented by only two genera. They live exclusively in running waters that are generally rather large and not very cold. Although sometimes abundant locally, they have not been recorded often from Canada and are rather

poorly represented in Canadian collections.

KEY TO GENERA

1a Phallic apparatus located between the preanal appendages. Male tergite VIII extended posterad as a plate (fig 105-110). Vaginal apparatus bearing a very long slender ventral rib (fig 116-120) .....Protoptila Banks p 21

1b Phallic apparatus located well below the preanal appendages. Male sternite VIII not extended posterad into a plate (fig 111) Vaginal apparatus without long slender rib (fig 121) ....Culoptila Mosely p 24

Genus Protoptila Banks

Protoptila Banks, 1904b, p 215. Type species by original designation: Beraea? maculata Hagen.

Spurs 0, 4, 4. Venation (fig 104): only forks 1, 2, and 3 are present in the forewings and fork 2 in the hindwings.

Male genitalia (fig 105-110): sternite VIII greatly extended ventrally posterad as a large, generally bifid plate, probably replacing the missing claspers. Segment IX well developed, but entirely invaginated into segment VIII, and with its apico-ventral edge greatly extended posterad. Segment X membranous and

inconspicuous. Preanal appendages prominent, simple or bipartite, and curved downward. Claspers indistinct or missing. Phallic apparatus located between the preanal appendages, very large and complex basally. Aedeagus thickened distally, with two lateral spines, which are probably the parameres, attached to an erectile membranous base.

Female genitalia (fig 116-120): ventro-lateral portion of sternite VIII forming two flanges with very long cilia. Segments X and XI fused into large triangular lobes with apical cerci. Ventral portion of segment X forming a simple or three-lobed lip, weakly or strongly convex, to which are attached two digitiform lobes, similar and symmetrical to the cerci. Ano-vaginal vestibule very broad, wide open, and with sclerotized walls. It contains the vaginal apparatus, which is small and rather simple, with a very slender chitinous rib, that is as long as two of the abdominal segments.

Protoptila is a large genus that is widely distributed in the Nearctic regions of the Americas, but only four of its most northern species live in Canada. These species live in not very cold running waters and often in large, slow streams.

KEY TO MALES

Genitalia made up of complex parts located above a large ventral plate.

1a Sternite VIII wide, slightly extended posterad and unnotched (fig 110, 115) .....erotica Ross p 22

1b Sternite VIII greatly extended posterad (fig 105) 2

2a Sternite VIII forming a plate that is broadly and slightly depressed distally (fig 113) .....tenebrosa Walker p 24

2b Sternite VIII forming a plate that is deeply notched distally (fig 107, 114) 3

3a Sternite VIII forming a wide, short, densely ciliated plate with a wide triangular notch (fig 114) .....coloma Ross p 22

3b Sternite VIII forming a narrow plate with a narrow notch (fig 107) 4

4a Parameres short, thick, and curved upward like spurs (fig 108) .. ..maculata Hagen p 23

4b Parameres long, slender, slightly sinuate, and not curved upward (fig 106) .....lega Ross p 23

KEY TO FEMALES

Genitalia simple, blunt, and bearing two slender cerci.

1a Median rib of vaginal apparatus short and barely extending anterad of the anterior edge of sternite VIII (fig 120) ....tenebrosa Walker p 24

1b Median rib of vaginal apparatus longer, and extending far anterad of the anterior edge of sternite VIII (fig 116).....2

2a Vulval lip very prominent and forming a pronounced median lobe that is quite distinct from the lateral parts (fig 119) ....coloma Ross p 22

2b Vulval lip neither prominent nor three-lobed (fig 118) 3

3a Ventro-lateral lobes of sternite VIII small and very inconspicuous (fig 118) .....erotica Ross p 22

3b Ventro-lateral lobes of sternite VIII fairly large and subtriangular (fig 116, 117) ....lega Ross p 23 and maculata Hagen p 23

Protoptila coloma Ross

Protoptila coloma Ross, 1941, p 45.

Male genitalia (fig 109, 114): sternite VIII extended ventrally as a thick, prominent horizontal plate, rather broadly trapezoidal, with a very large apical notch shaped like a rounded triangle. Its edges are densely ciliated. Superior apical corners of this sternite are extended into a rather strongly spiny lobe. Preanal appendages made up of two parts joined end to end. The first is rather rounded

and without prominent corners. The second is one and a half times higher and has rounded corners, except for the inferior apical corner, which is somewhat elongate and pointed. Aedeagus with a voluminous head and complex internal texture. Parameres minute, slender, and sinuate, attached to an erectile membranous base that is twice as long as they are. (Myrtle Creek, Oregon).

Female genitalia (fig 119): vulval lip very strongly convex and made up of three lobes. The median lobe is especially stout and prominent. Lateral lobes of sternite VIII small, low, and broadly rounded. Median rib of vaginal apparatus long and slender. (Myrtle Creek, Oregon).

This species is fairly similar to tenebrosa from which it can be distinguished by its blunter preanal appendages, by the larger apex of its aedeagus, and especially by the ventral plate formed by sternite VIII, which is thicker, shorter, and very deeply notched.

P. coloma has been reported from California, Oregon, Colorado, and Montana.

Protoptila erotica Ross

Map 8

Protoptila erotica Ross, 1938, p 113

Male genitalia (fig 110, 115): sternite VIII slightly extended

ventrally as a thick, short plate that is as large as the corresponding tergite and without any apical depression. Consequently, the ventral portion of segment IX is also not very extended. Superior apical corners of sternite VIII absent. Preanal appendages fairly slender and made up of two parts joined end to end. The first part has its superior apical corner extended into a fairly long lobe. The second part is shaped like a very elongate triangle, with its apex acute and curved downward. Aedeagus complex with a rounded process projecting from its inferior median edge and a voluminous, complex, roughly triangular distal end with a notched apical edge. Parameres small, very sinuate, and attached to an erectile base that is longer than they are. (Yellowstone National Park, Utah).

Female genitalia (fig 118): vulval lip broadly and strongly bulged, with its edge simple and without a lobe. Lobes of sternite VIII small, very low, and angular. Median rib of vaginal apparatus long and particularly slender. (Yellowstone National Park, Utah).

P. erotica has an appearance that is distinctly different from the other species because of the shape of its various appendages and, in particular, because of sternite VIII being only slightly extended, wide, and unnotched.

This species is widely distributed in Nearctic North America: Quebec, Illinois, Wisconsin, Minnesota, Wyoming, Utah, and New Mexico.

Protoptila lega Ross

Map 8

Protoptila lega Ross, 1941, p 48.

This species is extemely similar to maculata from which it can be distinguished by the following characters (fig 106, 107). Sternite VIII extended into a somewhat less slender plate, with a slightly less deep apical notch. Superior apical corners of this segment at right angles and not extended. Preanal appendages of the same shape as those of maculata, but slightly more slender and somewhat more distinctly curved. Aedeagus slightly longer, slightly more slender, with a somewhat more distinct head, which is obliquely truncated, but nevertheless slightly notched, distally. Parameres long, slender, and somewhat sinuate. (Streetsville, Ontario).

Female genitalia (fig 117): vulval lip slightly bulged, with a slight median depression. Lobes of sternite VIII quite prominent, subtriangular, and with rounded corners. Median rib of the vaginal apparatus very long and rather stout at its anterior end. (Original figure from Ross, 1944).

This species can be distinguished from maculata only by referring to the above characters.

P. lega has been reported from New Brunswick, Ontario, Illinois, Missouri, and Wisconsin, but only sporadically to date.

Protoptila maculata Hagen

Map 8

Beraea? maculata Hagen, 1861, p 296.
Protoptila lloydi Mosely, 1934, p 151.
Protoptila maculata: Ross, 1944, p 43.
Protoptila expositionis Nimmo, 1966, p 690. N. syn.

Male genitalia (fig 108, 112): sternite VIII greatly extended ventrally into a narrow plate, which is slightly arched upward, somewhat sinuate, ending in two sharp points separated by a narrowly triangular notch. Superior apical corners of this sternite somewhat prominent and ciliated. Preanal appendages extended as very long triangles, rather wide at mid-length, ending in a slender point directed downward. Inferior basal corner of this appendage forming a large subspherical outgrowth. Aedeagus rather slender distally where it is truncated at right angles and slightly notched. Parameres thick and extended as stout spurs curved upward. (Shoals, Indiana).

Female genitalia (fig 116): vulval lip only slightly convex, simple, not three-lobed, and with a very slight median projection.

Lobes of sternite VIII large, quite prominent, subrectangular, and with rounded corners. Median rib of vaginal apparatus very long, with a somewhat thickened anterior portion. (Shoals, Indiana).

This species can be recognized mainly by the shape of sternite VIII and by its short thick curved parameres. It is extremely similar to lega.

P. expositionis Nimmo was described on the basis of a single specimen in which sternite VIII and the ventral portion of segment IX are completely absent, while the other genital parts are identical to those of maculata. These characters are not considered specific. The type for expositionis is probably a malformed maculata male, in which sternite VIII and segment IX are missing teratologically.

P. maculata is very widely distributed in the north-eastern region of the continent: Quebec, Ontario, Illinois, Indiana, District of Columbia, Kentucky, New York, and Pennsylvania.

Protoptila tenebrosa Walker

Map 9

Hydroptila tenebrosa Walker, 1852, p 134.
Protoptila tenebrosa: Ross, 1944, p 43.
Protoptila tenebrosa: Nimmo, 1974, p 328.

Male genitalia (fig 105, 113): sternite VIII greatly extended

ventrally as a stout, horizontal, sparsely spiny plate shaped like an elongate trapezoid, and broadly and slightly notched distally. Superior apical corners of this sternite extended into a rather densely spiny horn. Preanal appendages consisting of two parts joined end to end. The first is regularly subrectangular, but without prominent corners. The second is also shaped like an irregular rectangle, but its superior and inferior apical corners are extended into two short spurs curved antero-ventrad. Aedeagus with a voluminous head and deeply notched distally. Parameres rather thick, moderately long, horizontal, straight, and curved downward apically. (Raquette River, New York).

Female genitalia (fig 120): vulval lip moderately convex, made up of three subequal and not very prominent lobes, with the median lobe slightly depressed centrally. Lobes of sternite VIII rounded and very low. Median rib of vaginal apparatus very regularly slender and barely extending anterad of the anterior edge of sternite VIII. (Leskard, Ontario).

This species is easily recognized by the large ventral plate of sternite VIII, which is only slightly notched distally, and by the preanal appendages ending in two curved acute points.

P. tenebrosa is widely distributed in the centre of the continent: Ontario, Michigan, Wisconsin, New York, Minnesota, Arkansas, Wyoming, Montana, Idaho, and Alberta. It lives mainly in calm and moderately-sized streams. The known period of flight extends from June to August.

Genus Culoptila Mosely

Culoptila Mosely, 1954, p 336. Type species by original designation: Culoptila aluca Mosely.

This genus was created for several Mexican species, and subsequently several Nearctic species were added. It was originally based on the very well developed tegulae of the male, but in the only Canadian species, cantha Ross, these tegulae are of normal size, as in Protoptila. Nevertheless, several characters of the venation and genitalia indicate that cantha should be included in the genus Culoptila.

Culoptila cantha Ross

Map 9

Culoptila cantha Ross, 1938, p 113.
Culoptila cantha: Flint, 1974, p 284.

Venation: apical forks 1, 2, 3, and 4 present in the forewings, and 2 and 3 probably present in the hindwings. Spurs 0, 3, 3.

Male genitalia (fig 111): tergite and sternite VIII contiguous, regularly short, and without a postero-ventral extension. Segment IX contained within segment VIII, but it has been so profoundly modified

and reduced that it is no longer visible or recognizable as such. Its ventral portion, however, forms a thin, horizontal plate. Segment X not visible or missing. Preanal appendages made up of two parts: a thin and horizontal basal part, and a more voluminous vertical part that is rather regularly rectangular, with its anterior apical corner right-angled and its posterior apical corner extended into a slender horn. Phallic apparatus located well below the preanal appendages, very large, and with such a profoundly modified structure that its elements can no longer be identified. There is a large phallocrypt extended posterad as a large ogival roof and concave ventrad. This roof protects a large straight horizontal chitinous spine, surrounded by membranous and undoubtedly erectile lobes and by two pairs of thin chitinous parts. (Yellowstone National Park, Utah).

Female genitalia (fig 121): segments X and XI fused not into two triangles, but into a roof-like dorsal part that bears the cerci. Vulval lip very broadly concave. Vaginal apparatus simple but very large, for the most part membranous, without a median rib, and terminating anterad in a large lozenge-shaped part with slightly concave anterior edges and an acute apex. (Yellowstone National Park, Utah).

C. cantha is widely distributed in the Nearctic region: Saskatchewan, Idaho, Maine, Maryland, Utah, Wyoming, Colorado, New Mexico, and Arizona. In Canada, it has been reported from but a single locality: S. Saskatchewan River, close to Lemsford, VI-29-1972 (DH Smith).

Family Philopotamidae Stephens

Philopotamidae Stephens, 1829, p 1. Type genus: Philopotamus Leach.
Philopotamidae: Ross, 1956, p 24.

Head with occipital portion well developed and extended in a wide curve far posterad of the eyes (fig 123). Ocelli present. The two palpi are of considerable length, with the terminal article very long, flexible, and whip-like; the maxillary palpi have five articles; the second is twice as long as the first and the fifth is twice as long as the fourth (fig 122). Spurs 2, 4, 4 or 1, 4, 4. Midlegs of the female not broadened (except in certain Chimarra). Abdominal blood gills absent and internal gland of abdominal sternite V present but small.

Wings regularly oval, of similar shape in both pairs of wings and in both sexes. Venation usually complete, with all forks present: I, II, III, IV, and V in the forewings and I, II, III, and V in the hindwings. Discoidal cell present and closed in both wings, and median cell closed in forewings. Cross veins C-Sc and R1-R2+3 present in the forewings. Two or three anal veins in the hindwings. The veins of the forewings are slightly concentrated toward the anterior edge, so that the cells of the posterior half of the wing are wider than the others (fig 124, 146, 164).

Male genitalia greatly simplified: segment IX annular, but greatly reduced dorsally. Preanal appendages present, as elongate lobes or outgrowths. Segment X formed as a lightly sclerotized or

membranous roof, simple or bilobate. Intermediate appendages present or absent. Claspers uni- or biarticulate. Phallic apparatus with the aedeagus and the parameres consistently absent and with the phallotheca and the endotheca reduced and variously modified.

Female genitalia: posterior segments extended or not extended into an ovipositor. Apodemal rods generally present. Segment IX virtual or missing. Segment XI paricularly hairy. Cerci uni- or biarticulate. Ano-vaginal vestibule short and with membranous walls. Vulval scale absent. Ano-vaginal opening located at the apex of segment X. Vaginal apparatus very simple and nonevaginable during mating.

The Philopotamidae are naturally divided into two subfamilies: the Philopotaminae, the more primitive of the two, and the Chimarrinae, which are distinctly more specialized, with respect to the venation as much as the genitalia. Ubiquitously distributed, they are rather poorly represented in Canada. There are but a dozen species, divided into three genera. All are limited to lotic habitats. The larvae live under stones where they build trap-shelters shaped like long cylindrical sacks, made entirely of silk. With their opening directed upstream, these sacks filter the water and trap the organic debris that the larvae feed on. The pupal cases are dome-shaped and constructed of pebbles.

KEY TO SUBFAMILIES

1a Spurs 2, 4, 4. Discoidal cell of forewing shaped like long pointed arch; fIV present (fig 124, 146) ....Philopotaminae p 26

1b Spurs 1, 4, 4. Discoidal cell of forewings short and wide, with its anterior point thickened; fIV absent (fig 164).....
.....Chimarrinae p 34

Subfamily Philopotaminae Stephens

Philopotaminae Stephens, 1829, p 2. Type genus: Philopotamus Leach.

Spurs 2, 4, 4. Venation of forewings fine and regular. Discoidal cell of forewings ogival. Thyridial cell large. FIV present and particularly wide. Anal veins of hindwings not forming large loop.

Male genitalia: segments VIII and IX of the same size as the preceding segments so that the genital parts are large compared with the abdomen and prominent. Segment IX regularly shaped. Segment X as a rather thin roof, whole or bilobate, with free and elongate preanal appendages and without intermediate appendages. Claspers very large, horizontal, made up of two simple and quite distinct articles, and with their internal faces more or less armed with thin fine spines. Phallic apparatus of very variable size and always bearing endothecal spines.

Female genitalia always somewhat extended into an ovipositor that is never very long. Segment VIII made up of a tergite and a

sternite. Apodemal rods of a length which is proportional to the extension of the posterior segments.

In Canada, the Philopotaminae are represented by only two genera limited to running waters.

KEY TO GENERA

1a Fork I of both wings with a peduncle of variable length. Hindwings with three free anal veins (fig 124) ....Dolophilodes Ulmer p 26

1b Fork I of both wings sessile or absent. Hindwings with two free anal veins (fig 146-147) .....Wormaldia McLachlan p 31

1c Wings reduced to minute scales.....
.....winter females of Dolophilodes distinctus Walker p 29

Genus Dolphilodes Ulmer

Dolophilodes Ulmer, 1909, p 125. Monobasic type species:
Dolophilodes ornatus Ulmer.

Trentonius Betten and Mosely, 1940, p 11. Type species by original designation: Trentonius distinctus Walker

Spurs 2, 4, 4. Forewings brown and lightly specked with gold. In both wings, f1 with a petiole of variable length. In the hindwings, three anal veins freely reach the wing margin (fig 124). Male sternites VII and VIII without plates or ventral lobes.

Male genitalia (fig 125-135): apico-dorsal edge of tergite VIII not modified. Segment IX notched apico-laterally for attachment of the clasper bases. Preanal appendages of variable size, always ear-like or as short lobes. Segment X either slightly or completely cleft into two lobes. Claspers with the second article either subequal to or shorter than the first. Phallic apparatus greatly modified into a very characteristic structure. The phallotheca is an internal membranous pouch, of variable size, sometimes very large ending posterad as a point that is slightly evaginated under segment X. Its left inferior portion is concave and bears a membranous and erectile cylinder, ending in a long evaginable spine. Endotheca entirely contained within the phallotheca, bearing a large phallotremal sclerite, clearly visible and evaginable during mating.

Female genitalia (fig 136-139) not very elongate. Segment VII not modified. Segment VIII not much smaller than segment VII and generally made up of a tergite and a sternite; the sternite with a fairly short apodemal rod and sometimes open ventrally. Those of segment X are small, but distinctly longer. Segment XI very large. Vaginal apparatus simple and slender. Cerci biarticulate.

Dolophilodes is a large genus with an Oriental, Australian, South African, Neotropical, and Nearctic distribution; it has been divided into several subgenera, of which only the type subgenus is

represented in Canada, by a half-dozen species limited to the cold and running waters of the mountains and hills of eastern and western North America. The species of Dolophilodes have a similar biology to those of Rhyacophila and are not as successful as the latter, although they are sometimes abundant locally.

KEY TO MALES

Genitalia with large biarticulate claspers forming oval pincers.

1a First article of claspers with an internal row of transversal spines (fig 126). Second article of claspers half as long as the first (fig 125) .....novusamericanus Ling p 29

1b Species without these characters 2

2a Second segment of claspers with inferior edge broadly and regularly concave (fig 132) .....distinctus Walker p 28

2b Species without this character 3

3a Second article of claspers club-shaped (fig 130). Segment X cleft mesally for its entire length (fig 131) .....dorcus Ross p 29

3b Species without these characters 4

4a First article of claspers distinctly higher basally than distally.

Endothecal spine stout and clearly visible (fig 124).....
.....pallidipes Banks p 30

4b First article of claspers with both edges subparallel. Endothecal spine slight and poorly visible (fig 128) ...aequalis Banks p 28

KEY TO FEMALES

Genitalia ending in a short ovipositor bearing two minute apical cerci.

1a Segment VIII almost twice as long as high (fig 140) .....
.....pallidipes Banks p 30

1b Segment VIII not longer than high (fig 136-139) 2

2a Segment VIII without a tergite (fig 139) .....
..... novusamericanus Ling p 29

2b Segment VIII bearing a tergite (fig 136) 3

3a Sternite VIII completely open apico-ventrally and forming but a very thin ventral bridge (fig 137) .....aequalis Banks p 28

3b Sternite VIII continuous ventrally for quite some length (fig 136, 138) 4

4a Sternite VIII bearing a long, fine anterior apodemal rod (fig 138) .....distinctus Walker p 28

4b Sternite VIII bearing a barely distinct anterior apodemal rod (fig 136) .....dorcus Ross p 29

Dolophilodes aequalis Banks

Map 10

Philopotamus aequalis Banks, 1924, p 450.
Dolophilodes aequalis: Nimmo, 1974, p 331.

Body dark brown or black, entirely covered with a silvery sheen. Antennae blackish, lightly ringed with reddish-brown. Legs brownish russet. Forewings rather uniformly golden gray, with a few dark brown spots, especially on the posterior portion of the wing and on the anastomosis. Venation: in both wings, f1 generally shorter than its petiole. Forewing 9-11 mm long.

Male genitalia (fig 128-129): segment IX rather short dorso-laterally and deeply notched ventro-laterally. Segment X greatly reduced distally, ending in two small parallel lobes, which are not very distinct and are directed obliquely downward. Preanal appendages small, with their inferior edge concave. Claspers very large and high, and consisting of two articles of subequal length.

Superior and inferior edges of first article straight and parallel. Edges of second article also straight and slightly convergent apically. Phallic apparatus relatively small and entirely contained within segment VIII. Accessory spine small and inconspicuous. (Grand Forks, British Columbia).

Female genitalia (fig 137, 142): tergite VIII appearing regularly rectangular in lateral aspect. Sternite VIII almost entirely open apico-ventrally, appearing triangular in lateral aspect and forming but a very short ventro-anterior bridge. It bears a short, wide apodemal rod. Segment X distinctly higher than long. Vaginal apparatus (fig 142). (Grand Forks, British Columbia).

This species can be easily recognized by its black body, by its golden grey and not very spotted forewings, and by the two subparallel edges of its claspers.

D. aequalis is widely distributed in western North America: British Columbia, Alberta, Washington, Utah, Idaho, Wyoming, Oregon, California, Colorado, New Mexico, and Nevada. It is often abundant locally, close to medium- and small-sized turbulent streams, at altitudes between 500 and 1,000 m. The known flight period extends from early May to early August.

Dolophilodes distinctus Walker

Map 11

Philopotamus distinctus Walker, 1852, p 104.
Philopotamus americanus Banks, 1895, p 316.
Trentonius distinctus: Ross, 1944, p 47.

Body dark brown or brownish russet, covered with golden hairs. Legs reddish-brown. Antennae indistinctly ringed with lighter colour. Forewings dark brown, finely and regularly specked with gold. Venation: fork I of medium length, rather wide in forewings and distinctly smaller in hindwings. Forewing 6-8 mm long.

Male genitalia (fig 132-133): segment IX angulate dorso-laterally. Segment X extended distally and cleft into two digitiform lobes that are two or three times longer than wide. Preanal appendages rather wide and quite discrete. Claspers relatively short with two articles of subequal length. The second article is distinctly thinner than the first, and its inferior edge is broadly and regularly concave. Phallic apparatus of considerable size, extending anterad beyond segment VII and with an extensively wrinkled membrane. Its apical portion contains a dark mass that appears as a zone of dense, minute spinules. (Cataract, Ontario).

Female genitalia (fig 138, 144): tergite and sternite VII appearing irregularly angulate in lateral aspect. Sternite VII closed ventrally and with a rather large, arched apodemal strap. Segment X particularly large. Vaginal apparatus (fig 144). (Masham, Quebec).

This is the only species in the genus that lives in eastern and central North America.

D. distinctus is widely distributed and common in eastern and central North America, from Newfoundland to North Carolina and westward to Minnesota. It lives in a large number of small, turbulent streams.

This species emerges from the pupal case throughout the year; it is remarkable in that the females that emerge during the winter months are apterous. There is no intermediate stage at mid-season between macropterism and apterism. In addition, study of the pupae shows that the wing cases are also absent at this stage. The nondevelopment of the wings is therefore probably due to the effect of temperature on late larval stages. The proportions of the appendages and of segment X are also rather variable; the largest specimens have the shortest and thickest parts. Since these individuals also appear during the winter months, it seems that temperature also affects the proportions of the genital parts (Ross, 1944). This species can be collected throughout the year near the same stream.

Dolophilodes dorcus Ross

Map 12

Philopotamus dorcus Ross, 1938, p 132.

Philopotamus oregonensis Ling, 1938, p 63.

Dolophilodes novusamericanus: Schmid, 1980. pro parte, female only.

Body brown with golden hairs. Legs reddish-brown and antennae slightly ringed with darker colour. Forewings dark brown and intensely, finely, and regularly specked with gold. Venation: fork 1 short in both wings, although sometimes absent in the hindwings. Forewings 6.15-10 mm long.

Male genitalia (fig 130-131): segment IX with its dorso-lateral portion rounded but not very developed. Segment X cleft for its entire length and forming two well-sclerotized lobes that are narrow basally, enlarged at mid-length, pointed distally, and widely separated. Preanal appendages large, slender, oblique dorsad, and ear-shaped. Claspers not very long, consisting of two articles of subequal length with irregular contours. Second article, in particular, narrow basally and enlarged into a club that is rounded apically. Phallic apparatus of large size, with not very folded walls, and with the accessory spine clearly visible. (Sayward, northern Vancouver Island).

Female genitalia (fig 136, 143): tergite and sternite VIII appearing irregularly shaped in lateral aspect; tergite with barely distinct apodemal strap. Tergite X small and corresponding sternite formed as a large prominent lobe. Vaginal apparatus (fig 143). (Tombstone Prairie, Oregon).

This is the most characteristic species of the genus by virtue of its large preanal appendages, its completely cleft segment X, and its irregularly contoured claspers. The female was described under the name of novusamericanus by Schmid, 1980, p 48, (fig 195-196).

D. dorcus is the most common and abundant species in western North America: British Columbia, Washington, Oregon, and California. It is localized in the Cascade Range and further west. It is found in almost all small- and medium-sized turbulent streams. The known period of flight extends from June to September.

Dolophilodes novusamericanus Ling

Map 12

Philopotamus novusamericanus Ling, 1938, p 63.
Dolophilodes novusamericanus: Nimmo, 1974, p 332.

Body entirely brownish russet and covered with golden hairs. Legs yellowish and antennae distinctly ringed with brown and yellow. Forewings dark brown and covered with golden spots of rather irregular dimensions. Venation (fig 124): fork 1 generally with a short petiole in both wings. Forewing 6-9 mm long.

Male genitalia (fig 125-127): segment IX elongate and angular dorso-laterally. Segment X forming two contiguous ovoid lobes. Preanal appendages appearing small, not very prominent, and ovoid, in lateral aspect. Claspers rather slender. First article arched upward and with its internal face bearing a longitudinal row of stout golden spines perpendicular to the long axis of the clasper. Second article half as long as the first and distinctly arched downward. Phallic apparatus of considerable size, extending to the interior of sternite

VII and almost as high as the abdomen. The accessory spine is rather well developed. (Clear Creek, California).

Female genitalia (fig 139, 141): tergite VIII absent. Sternite VIII appearing irregularly quadrangular in lateral aspect, entirely closed ventrally and with a short apodemal rod. Tergite X small and corresponding sternite large. Segment XI rather elongate. Vaginal apparatus (fig 141). (Shuksan, Washington).

This species can be recognized immediately by the small size of the second article of its claspers and by the row of internal bristles on the first article.

D. novusamericanus is rather widely distributed in western North America: British Columbia, Washington, Utah, Idaho, Oregon, and California. It lives mainly in small turbulent streams, but also in madicolous shelters and slow-flowing waters. The known period of flight includes May and August.

Dolophilodes pallidipes Banks

Map 13

Philopotamus pallidipes Banks, 1936, p 267.

Dolophilodes pallidipes: Denning, 1949, p 115.

Dolophilodes nora Nimmo, 1977, p 69. N. syn.

Body light reddish-brown with golden hairs. Legs yellow and

antennae faintly ringed with lighter colour. Maxillary palpi of male distinctly longer and more slender than those of other species in the genus. Forewings extensively spotted with gold and brownish grey in approximately equal proportions, but with the golden spots larger in the post-costal area. Membrane rather light-coloured, with veins clearly visible. Venation: in the forewings, fork 1 generally present and extremely short and usually absent in the hindwings. Forewing 7-8 mm long.

Male genitalia (fig 134-135): segment IX appearing rather irregularly shaped in lateral aspect, with its superior lateral portion developed into a rounded flange that obscures much of the base of segment X and the preanal appendages. The preanal appendages are small and oval. Segment X weakly sclerotized, sharply angled downward, and cleft into two more or less rounded lobes that are not very distinct, and covering each other. Claspers particularly long, with two articles of subequal size, and bluntly rounded basally and apically. Phallic apparatus large, filling all of sternite VII and with the accessory spine stout, clearly visible, and bearing a short supplementary basal branch. (Squamish, British Columbia).

Female genitalia (fig 140, 145): segment VIII formed as a very regular rectangle almost twice as long as high. Sternite VIII entirely open ventrally, with the apodemal strap thick and contorted. Segment X extended along the same lines as segment VIII. Vaginal apparatus (fig 145). (Salmo Pass, British Columbia).

This species can be easily recognized by its light golden reddish-brown colouration and the rounded shape of the two ends of its claspers.

D. pallidipes is widely distributed in western North America: British Columbia, Alberta, Alaska, Washington, Montana, Idaho, Oregon, and California. It appears rather rarely and lives in small turbulent streams. The known period of flight extends from May to September.

I established the synonymy of nora by examining the holotype.

Genus Wormaldia McLachlan

Wormaldia McLachlan, 1865, p 140. Type species designated by Ross, 1949: Hydropsyche occipitalis Pictet.

Dolophilus McLachlan, 1868, p 301. Monobasic type species: Dolophilus copiosus McLachlan.

Paragapetus Banks, 1914, p 202. Monobasic type species: Paragapetus moestus Banks.

Dolophiliella Banks, 1930, p 230. Type species by original designation: Dolophiliella gabriella Banks.

Spurs 2, 4, 4. Femurs of hindlegs with long silky hairs. Forewings uniformly brown or specked with gold. Venation (fig 146-147): in both wings, f1 may be absent or present; if present, it is sessile. In the hindwings, there are three anal veins, but A1 merges with A2 basally, and does not reach the edge of the wing.

Abdominal sternites VII, VIII, and IX sometimes with lobes or large ventral plates.

Male genitalia (fig 148-155): tergite VIII with its apico-dorsal edge sometimes forming slight lobes. Segment IX not notched latero-apically for the attachment of the clasper bases. Segment X formed as an ogival roof and not cleft distally. Preanal appendages always extended as elongate, digitiform lobes. Intermediate appendages always absent. Claspers with the second article of equal length as, or longer than, the first article. First articles fused together basally over a more or less great length. Phallic apparatus rather small, consisting of a phallotheca shaped like a tube with a wide base, into which is invaginated a finely spiniferous endotheca.

Female genitalia (fig 156-161) extended into a rather long ovipositor and bearing apodemal rods of proportional lengths. Sternite VII sometimes somewhat modified. Segment VIII much smaller than segment VII and made up of a tergite and a sternite. Segment X rather large. Segment XI small. Vaginal apparatus very small, simple, and ring-shaped. Cerci uniarticulate.

Wormaldia is a medium-sized genus, and it has a Holarctic, Oriental, African, and Neotropical distribution. Out of sixteen Nearctic species, only four are Canadian.

KEY TO MALES

Genitalia with claspers biarticulate and forming oval pincers.

1a Abdominal sternites VII and VIII each forming a large, free ventral plate (fig 148, 150) 2

1b Abdominal sternites VII and VIII not forming large, free ventral plates (fig 152, 154) 3

2a Second article of claspers distinctly longer than the first and broadly curved upward (fig 148) .....gabriella Banks p 32

2b Second article of claspers distinctly smaller than the first and not curved upward (fig 150) .....moesta Banks p 33

3a Sternite VII with a short ventral point. Second article of claspers with both edges subparallel (fig 154) .....occidea Ross p 33

3b Sternite VII without a short ventral point. Second article of claspers with both edges slightly concave (fig 152) .....anilla Ross p 32

KEY TO FEMALES

Genitalia ending in a slender ovipositor and bearing two apical cerci.

1a Sternite VII with antero-ventral edge simple and without teeth or prominent corners (fig 156). Western species.....
.....gabriella Banks p 32

1b Sternite VII with antero-ventral edge simple and without teeth or prominent corners (fig 160). Eastern species .....
.....moesta Banks p 33

1c Sternite VII with antero-ventral edge forming a sharp tooth (fig 158). Western species .....
.....anilla Ross p 32 and occidea Ross p 33

Wormaldia anilla Ross

Map 14

Dolophilus anillus Ross, 1941, p 50.

Body dark brown with dark golden hairs. Legs grey reddish-brown. Antennae dark brown, very indistinctly ringed with light colour. Forewings uniformly dark golden brown. Venation: f1 present and sessile in both wings. Forewing 5-7 mm long.

Male genitalia (fig 152-153): sternites VII and VIII without pointed extension, at most with a sharp corner. Tergite VIII with

apico-dorsal edge forming two blunt bulges. Segment IX appearing rather angular in lateral aspect, with a fine apico-ventral point. Preanal appendages as simple elongate lobes. Segment X barely longer than preanal appendages and abruptly reduced before its extremity. Claspers with first articles barely longer than high and fused to each other for almost all of their length. Second article very distinctly longer than the first, with both its edges slightly concave. Phallic apparatus with two or three endothecal spines and a zone of fine spinules. (Southern Vancouver Island, British Columbia).

Female genitalia (fig 158, 159): sternite VII with its ventro-basal portion forming a free, sharp tooth. (Cultus Lake, British Columbia).

This species is very similar to occidea, from which it can be easily distinguished by the total absence of sternal plates and by the second article of the claspers being longer than the first and somewhat reduced at mid-length.

W. anilla is recorded from British Columbia, Oregon, Washington, and California. It lives in small, more or less rapid creeks, which are sometimes swampy. Its known period of flight extends from May to September.

Wormaldia gabriella Banks

Map 15

Dolophilielia gabriella Banks, 1930, p 230.

Wormaldia gabriella: Nimmo, 1974, p 333.

Body light reddish-brown, densely covered with golden hairs. Legs yellow. Antennae distinctly ringed with brown and yellow. Forewings greyish brown, not very dark, with a very few indistinct golden spots. Venation: fork 1 absent in both wings (fig 146). Forewing 7-9 mm long.

Male genitalia (fig 148-149): Sternite VII with a very long apico-ventral plate. Sternite VIII with a similar plate but distinctly shorter. Tergite VIII without a lobe or notch. Segment IX appearing angular in lateral aspect and with its apico-ventral corner sharp. Segment X angulate distally. Preanal appendages long, narrow, and simple. First articles of claspers thick, as high as long, and fused to each other over half of their length. Second article rather longer than the first, distinctly arched upward and with a well developed internal apical spiny armature. Phallic apparatus fairly small and apparently with a single endothecal spine. (Southern Vancouver Island, British Columbia).

Female genitalia (fig 156-157): sternite VII without extended corner or inferior basal tooth. (Wellington, Vancouver Island, British Columbia).

This species is the largest of our indigenous species, and it can be recognized by the second article of its claspers, which is long, massive and curved upward.

W. gabriella is widely distributed in western North America: British Columbia, Alberta, Montana, Oregon, Utah, Idaho, Colorado, California, and Nevada. It lives in very diverse streams, from very small creeks to fairly large rivers, which may be slow or rapid, turbulent or calm. The known period of flight extends from late June to late October; but it is abundant mainly in September and October.

Wormaldia moesta Banks

Map 15

Paragapetus moestus Banks, 1914, p 202.
Dolophilus breviatus Banks, 1914, p 254.
Wormaldia moesta: Ross, 1956, p 43.

Body brownish russet and densely covered with golden hairs. Legs yellow. Antennae distinctly ringed with brown and yellow. Forewings dark brown and covered with large golden spots. Venation: f1 sessile in both wings. Forewing 4-5.5 mm long.

Male genitalia (fig 150-151): sternites VII and VIII forming two plates that are free, narrow, and almost as long as these segments. Apico-dorsal edge of tergite VIII forming two slight, rounded lobes. Segment IX appearing massive and rounded in lateral aspect and forming an apico-ventral spur. Segment X with a slight apical basal median keel and distinctly acuminate distally. Preanal appendages attached relatively apically to segment X, slightly thinner basally and distally. Claspers with the two first articles fused to each

other only at their extreme bases and very blunt. Second article somewhat shorter than the first, and simple and blunt. Phallic apparatus with endotheca spineless, but with a zone of fine spinules. (Thunder River, Quebec).

Female genitalia (fig 160-161): sternite VII forming a blunt, but distinct, ventral basal corner. (Burke Falls, Ontario).

This species can be recognized easily by the ventral plates of sternites VII and VIII, and by the small size of the second article of the claspers.

W. moesta is very widely distributed in eastern North America: Ontario, Quebec,, New Brunswick, Nova Scotia, New York, Illinois, Pennsylvania, Indiana, Tennessee, Arkansas, Ohio, Wisconsin, North Carolina, Georgia, and Virginia. It lives in small turbulent creeks, and its known period of flight extends from June to August.

Wormaldia occidea Ross

Map 15

Dolophilus occideus Ross, 1938, p 134.

Body dark brown and covered in dark golden hairs. Legs grey reddish-brown. Antennae dark brown, very indistinctly ringed with light colour. Forewings uniformly dark golden brown. Venation (fig 147): fork 1 present and sessile in both wings, but occasionally

petiolate in hindwings. Forewing 5.5-7 mm long.

Male genitalia (fig 154-155): sternite VII with a short, tongue-like apico-ventral point barely half as long as the segment. Sternite VIII with a very blunt point in the same location. Tergite VIII forming two dorso-apical bulges that are rounded and very distinct. Segment IX appearing massive in lateral aspect and with a small apico-ventral lobe. Segment X produced as an extended triangle, rather slender and considerably longer than the preanal appendages. The latter as simple elongate lobes. Claspers with first articles distinctly longer than high and fused to each other for much of their length. Second article simple and somewhat shorter than the first. Phallic apparatus apparently with a single endothecal spine and a large zone of fine contiguous spinules. (Wellington, British Columbia).

Female genitalia indistinguishable from those of anilla. The vaginal apparatus is too small and too simple to provide usable specific characters (fig 158-159).

This species is very similar to anilla and can be recognized by the tongue-like point of sternite VII and by the second article of the claspers being shorter than the first and simpler in shape.

W. occidea is known from British Columbia, Washington, Montana, Oregon, and California. It lives in very small streams that are more or less rapid and more or less swampy. It apparently flies from late May to late September.

Subfamily Chimarrinae Wallengren

Chimarrhidae Wallengren, 1891, p 159. Type genus: Chimarrha (recte Chimarra) Stephens.

This subfamily is represented in Canada by only one genus.

Genus Chimarra Stephens

Chimarra Stephens, 1829, p 318. Monobasic type species: Phryganea marginata Linnaeus.

Spurs in male and female 1, 4, 4. In some species, the tarsi of the male forelegs are thickened, and the claws are enlarged and asymmetrical; this is more accentuated in the right leg than in the left (fig 162-163). Tibiae and tarsi of female midlegs sometimes somewhat flattened. Venation in the basal portion of the wings and in the anterior portion of the forewings thickened, and generally irregularly laid out, altering the shape of certain cells (fig 164). Hence, the discoidal cell is short and very wide, with its anterior point thickened and Rs somewhat sinuate. Median and thyridial cells very small. FIV absent and fV not especially wide. In the hindwings, the discoidal cell is also small and Sc is greatly thickened. There are three anal veins, but A1 and A2 meet early in a wide loop and reach the edge of the wing together.

Male genitalia (fig 165-174, 183-188): segments VII, VIII and IX of decreasing size; consequently the genitalia are small compared with the abdomen and not very prominent. Tergite and sternite VIII short and touching each other laterally. Segment IX complex in shape, deeply invaginated into the preceding segment, with its ventral face oblique dorsad and with a stout ventral lobe. Segment X small, membranous, and shapeless. Preanal appendages as small, very hairy outgrowths. Intermediate appendages present and directed laterally with respect to segment X. Claspers uniarticulate,, quite small and with a fairly complex internal texture. Phallic apparatus consisting of a tube-like phallotheca arising from a bulbous base and whose inferior apical corner is more or less pronounced. Endotheca membranous and entirely contained within the phallotheca. When it is evaginated, it reveals lobes and spines that are suprisingly and curiously shaped.

Female genitalia (fig 175-182) large, blunt, and very small compared with segment VII whose sternite forms a ventral corner. Tergite and sternite VIII entirely fused into a very short cylinder that is open dorsally and whose apical edge has a few tubercules bearing long setae. Segment X short, complex in shape, with a short apodemal rod. Segment XI large and bulbous, bearing biarticulate cerci. Vaginal apparatus simple and partially membranous.

Chimarra is a very large genus that is almost ubiquitous and which has strong Tropical affinities. There are but twenty or so Nearctic species, of which only four are Canadian; these are found in central and eastern Canada, from Newfoundland to Ontario. Canadian

Chimarra species can be easily recognized by their completely black colouration. They live in more or less turbulent running waters, are often abundant locally, and have a strong preference for light. Certain species can share the same habitat. The females are difficult to tell apart and are distinguished mainly by the vaginal apparatus. It is not possible to make up a key to the females; they will be identified through comparison with the figures.

KEY TO MALES

Genitalia with claspers uniarticulate.

1a Intermediate appendages long and narrow. Segment IX with a very discrete cylindrical ventral lobe. (fig 165-168).....2

1b Intermediate appendages as translucid plates bearing a toothed median keel. Segment IX with a simple triangular keel (fig 169-174) 3

2a Ventral lobe of segment IX as a long, slender rod. Claspers with a very rounded basal corner (fig 165) .....obscura Walker p 36

2b Ventral lobe of segment IX as a short cylinder. Claspers with a right-angled basal corner (fig 167) .....socia Hagen p 37

3a In lateral aspect, claspers appearing with two apical corners, one dorsal and one ventral (fig 173) .....utahensis Ross p 37

3b In lateral aspect, claspers appearing with only a single superior apical corner (fig 169, 171) 4

4a In posterior aspect, apico-lateral corner of claspers appearing right-angled. Internal face of claspers with a large rounded flange (fig 169).....aterrima Hagen p 35

4b In posterior aspect, apico-lateral corner of claspers appearing acute. Internal face of claspers with a deep, circular notch (fig 171) .....feria Ross p 36

Chimarra aterrima Hagen

Map 16

Chimarrha aterrima Hagen, 1861, p 297.
Chimarra aterrima: Ross, 1944, p 50.

Body black, with head and pronotum covered with concolourous hairs. Legs dark brownish russet. Fifth article of tarsi of male forelegs not thickened and with small claws. Female midlegs not flattened. Wings uniformly black. Venation: in the forewings, discoidal cell regularly ogival, not very wide, somewhat thickened apically, and with Rs barely sinuate. Forewing 5-8 mm long.

Male genitalia (fig 169-170, 185): segment IX with ventral face bearing a keel that appears bluntly triangular in lateral aspect. Segment X entirely membranous. Preanal appendages as small outgrowths. Intermediate appendages as subrectangular plates with rounded corners, semitranslucid and bearing a long, toothed median keel. Claspers subtriangular, with their base slender and their inferior apical corner rounded. In frontal aspect, the external apical corner appears right-angled and the apical edge horizontal. There is also a subtriangular median keel with blunt, rounded corners. Phallotheca extended continuously by the endotheca. The endotheca is voluminous distally, where it bears small spherical lobes, two slender and slightly asymmetrical subapical spines, and two double apical spines with two branches of different lengths and thicknesses. (Kazabazua, Quebec).

Male genitalia (fig 177-178): segment VIII with a short, wide apodemal strap and a slightly concave anterior edge. Segment X simple. Vaginal apparatus (fig 178). (Wakefield, Quebec).

This species is characterized by the regularly shaped discoidal cell of its forewings and by the features of the internal face of its claspers.

C. aterrima is one of the most common and most widely distributed species on our continent, from Newfoundland to Florida and Michigan to Virginia. It lives in almost all running waters and its known period of flight extends from late May to late August.

Chimarra feria Ross

Map 17

Chimarrha feria Ross, 1941, p 51.

This species is very similar to aterrima from which it is not easily distinguished; it can be recognized only by the following characters. In lateral aspect, the keel of the ventral face of segment IX is a more acute triangle and the claspers have more concave apical edges (fig 171). In frontal aspect, the external apical corner of the claspers is not right-angled, but acute. The apical edge of the claspers is sinuate and oblique. The internal flange is not triangular but has a large semicircular incision (fig 172). The endotheca bears two large symmetrical subapical spines that are attached to pedunculate bulbs. The apical spines are distinctly smaller than those of aterrima, but I have never seen them completely evaginated (fig 187). (Jock River, Ontario).

Female genitalia indistinguishable from those of aterrima.

This species can be distinguished from aterrima by the characters described above.

C. feria lives in all clear and rapid waters. Generally less common than aterrima, it is also widely distributed in eastern and central North America, from Newfoundland to Minnesota and to Texas. Its known period of flight extends from late May to early September.

Chimarra obscura Walker

Map 18

Beraea? obscura Walker, 1852, p 121.

Wormaldia plutonis Banks 11, p 358.

Chimarrha lucia Betten, 1934, p 175.

Chimarra obscura: Ross, 1944, p 51.

Body black, with dark yellow legs. Head and pronotum covered with dark golden hairs. Fifth article of tarsi of male forelegs thickened, and with enlarged, asymmetrical claws. Tibiae and tarsi of female midlegs slightly flattened. Wings uniformly black. Venation: discoidal cell of forewings wide and triangular, with its apex thickened and the distal portion of Rs distinctly sinuate (fig 164). Forewing 5.5-9 mm long.

Male genitalia (fig 165-166, 183-184): sternite VIII forming a ventro-apical tongue-like flap. Segment IX with its ventral face bearing a long, slender cylindrical lobe, five to six times longer than thick and extending beyond the apical edge of the segment. Segment X membranous, but with thin, sclerotized latero-basal thickenings. Preanal appendages ovoid and relatively large. Intermediate appendages as slender triangles, four to five times longer than high and blunt distally. Claspers relatively slender, with their inferior apical corner very rounded and their superior

apical corner extended into a curved lobe. In frontal aspect, they appear to form circular and slender pincers, with a quite pronounced basal corner. Phallotheca with its apical edge well defined and extremely oblique, and with its inferior apical corner curved into a strong hook. Endotheca complex and bearing two long paired basal spines and one unpaired apical spine. (Belleville, Ontario).

Female genitalia (fig 175-176): segment VIII with a simple anterior flange and with its apical edge deeply concave. Segment X forming a distinctly prominent superior basal corner. Vaginal apparatus (fig 176). (Belleville, Ontario).

This species is easily recognized by the long, slender ventral lobe of segment IX.

C. obscura is very widely distributed in central and eastern North America, from Newfoundland to Texas and from Manitoba to Oklahoma. It lives in clear and rapid streams, and its known flight period extends from late May to September.

Chimarra socia Hagen

Map 19

Chimarrha socia Hagen, 1861, p 297.

Wormaldia femoralis Banks, 1911, p 358.

Chimarra socia: Ross, 1944, p 51.

Body black, with legs dark yellow. Head and pronotum covered with bicoloured hairs, brown and dark gold. Fifth article of tarsi of male forelegs thickened and with enlarged and asymmetrical claws. Tibiae and tarsi of female midlegs slightly flattened. Wings uniformly black. Venation: discoidal cell of forewings wide, triangular, with its apex thickened and the distal portion of Rs slightly sinuate. Forewing 5-8 mm long.

Male genitalia (fig 167-168, 186): segment IX with a large, thick lobe arising from its ventral face, twice as long as high and with its ventral face concave. Segment X entirely membranous. Intermediate appendages extended into long, slender spurs that are sinuate and very sharp. Claspers long, rather slender, directed obliquely dorsad and with their inferior basal corner right-angled or slightly acute. In frontal aspect, they appear to form circular and slender pincers; at the base of each branch are a few setiferous tubercules. Phallotheca with its apical edge well defined, very oblique, and forming an apico-ventral tongue. Endotheca forming complex lobes, and bearing two long, straight, slender basal spines and two thick, irregular subapical spines that are curved into hooks. (Cascades, Quebec).

Female genitalia (fig 179-180): segment VIII with a short triangular apodemal point, and with its apical edge straight and notched. Sternite X simple. Vaginal apparatus (fig 180). (Cascades, Quebec).

This species can be recognized by the large and thick ventral lobe of segment IX and by the long, slender claspers.

C. socia is also an abundant species, and it is widely distributed in northern and eastern North America, from New Brunswick to Florida, and from Manitoba to South Carolina. It also lives in more or less rapid running waters, and its known period of flight extends from June to September.

Chimarra utahensis Ross

Chimarrha utahensis Ross, 1938, p 134.
Chimarrha idahoensis Ling, 1938, p 64.

Body black, with legs yellow reddish-brown. Head and pronotum sparsely covered with brown and yellow hairs. Fifth article of tarsi of male forelegs thickened and with large asymmetrical claws (fig 162-163). Forewings uniformly black. Venation: discoidal cell of forewings broadly triangular, with its apex thickened and Rs sinuate. Forewing 5.5-8 mm long.

Male genitalia (fig 173-174, 188): segment IX greatly extended anterad ventrally. It bears a subapical keel shaped like a very blunt triangle. Segment X membranous. Preanal appendages very small. Intermediate appendages extended as long, rectangular, semitranslucid plates, and with a slight median keel. Claspers large and blunt, with their ventral edge strongly curved upward. In lateral aspect, their two apical corners appear extended. In frontal aspect, the apical

corner appears as a fairly thick spur overhung by a small flange. The base of the appendage bears a few setiferous tubercules. Phallotheca with its apical edge well defined and extremely oblique, ending in an extremely fine point. Endotheca apparently bearing two spines and a large zone of minute spinules. (Custer State Park, Wyoming).

Male genitalia (fig 181-182): sternite VIII rather short with a simple rounded apodemal flange. Sternite X simple and uniformly sclerotized. Vaginal apparatus as two stout longitudinal parts. (Logan, Utah).

This species is recognized mainly by its blunt claspers and by the slender apex of its phallotheca.

C. utahensis has been collected in the states of Utah, Idaho, South Dakota, Wyoming, and California, but not yet in Canada.